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PUBLIC WORKS MINISTRY.

# REPORT

UPON THE

# ADMINISTRATION OF THE PUBLIC WORKS DEPARTMENT IN EGYPT

FOR 1903

ву 27132

SIR WILLIAM GARSTIN, G. C. M. G., UNDER SECRETARY OF STATE, PUBLIC WORKS DEPARTMENT

WITH REPORTS BY THE OFFICERS IN CHARGE OF THE SEVERAL BRANCHES
OF THE ADMINISTRATION.



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## PUBLIC WORKS DEPARTMENT.

# ADMINISTRATION REPORT FOR THE YEAR 1903.

My note upon Public Works Administration in 1903, must, of necessity, be a very brief one. Owing to my absence in the Soudan and the preparation of my report upon the Upper Nile Basin, the time available for writing my annual note has been extremely limited. The reports furnished by the heads of the different services concerned are, however, so complete in themselves that very little in the way of observation is required from me. These reports consist of the following:—

## I .- The Irrigation Service.

(a) Report by Mr. A. L. Webb, C.M.G., Inspector General of Irrigation, Upper Egypt.

(b) Report by Mr. K. E. Verschoyle, C.M.G., Inspector General of Irrigation, Lower Egypt.

## II .- Services, other than Irrigation.

(c) Report by Mr. A. H. Perry, Director General of Towns and Buildings.

(d) Report by Captain H. G. Lyons, Director General of the Survey Department.

(e) Report by Mohamed Pasha Anis, Chief of the Technical Service.

(/) Report by Monsieur G. Maspéro, Director General of the Antiquities Department.

(9) Report by Mr. G. Gunn, Inspector for the Agricultural Railways to the Ministry of Public Works.

(h) Report by Captain Stanley Flower, Director of the Government Zoological Gardens.

#### EXPENDITURE.

The following tables show the total sums expended in 1903, under the Budget of the Ministry of Public Works:—

#### TABLE I.

#### ORDINARY BUDGET.

					Tota	al	(4)	LE.	941901	723
Antiquities Departme	nt			***		***		***	14411	Own
Technical Service				***	040	0.00	10.0		14411	829
Survey Department		***	***		***			***	15090	531
Towns and Buildings							***	***	32485	352
Irrigation Branch					***			***	213029	258
Central Office		***			111	***	***		618783	912
									48100	841
									L.E.	Ma

This total is greater by L.E. 7380.927 Mill., than that of the year 1902, the increase being chiefly due to expenditure in Survey Department.

#### TABLE II.

EXTRAORDINARY BUDGET, OR WORKS EXECUTED UNDER SPECIAL CREDITS.

	L.E.	M.
Zifta Barrage (Caisse money)	98599	079
Drainage Works (Caisse money)	73313	807
Irrigation Improvements (Caisse money)	479843	845
Public Buildings (Caisse money)	106076 46414	440
Public Buildings (money found by other Departments).	40414	-300
Total L.E.	804247	574

This is less by L.E. 210738.250 Mill. than the expenditure, under the same head, in 1902. The decrease is due to the completion of the main expenditure upon the Zifta Weir and to a large reduction in the credits allowed for Public Buildings.

In addition to the expenditure shown in Table II, certain further sums were devoted to works not included in the above list, the credits for which were derived from various sources. This expenditure I have, as in last year's Report, grouped into a special Table, entitled "Various Extra Credits":—

#### TABLE III.

#### VARIOUS EXTRA CREDITS, 1903.

## Caisse de la Dette money.

											L.E.	M.
Special	lo	w Nile			***	****	 ***			***	5488	969
Special	lo	w flood	cre	edit		***	 				2954	865
Rosetta									***	***	8237 2601	266 105
Musenn								***	***	***	2374	303
Temple		Philæ					***		***	****	318	728
11		Edfu									1168	731
-								al	***	L.F	1. 23143	967
										- Channel		

## Money supplied by other Departments and Revenue.

						L.E.	Mi
				***		30257	-
ma	inte	nane	e)			1055	470
						9087	719
						263	041
		***	***	***	***	1	972
						2414	964
		Tota	1		L.	E. 43110	166
	***		000 000 000 000 000 000 000 000 000	010 000 000 000 010 000 000 100 000 000		*** *** *** *** *** *** *** *** *** ***	maintenance  30257   1055   1055   1055   1057   1058   1058 

The expenditure in this table is less than that for the year 1902, by L.E. 27055.157 Mill. The reduction is chiefly due to the reduced expenditure upon the Nile flood, and the completion of the repairs to the Philae Temples.

The following table gives a summary of the year's expenditure:-

#### TABLE IV.

## TOTAL EXPENDITURE IN 1903. Tables I. II. III.

Ordinary Budget Extraordinary Budget Various Extra Credits (1)		• •	 ***	***			941901 804247 66254	723 574 133
			Tota	ıt	***	L.E.	1812403	430
(1)—Irrigation State Buildings Survey Department Museum Department	***		 		17736 11797 30257 6462	696	) ;	133

The above total is less than that of 1902, by L.E. 230412.510 Mill. The payments made in 1902, to Sir John Aird and Co. for works connected with the Nile reservoirs, amounted to Pounds Sterling £50767 or L.E. 49497.825 Mill.

Adding this last sum to the figure given in Table IV, the total expenditure controlled by the Department of Public Works in 1903, was L.E. 1861901,255 Mill.

This is less than the total expenditure for 1902, by L.E.523131.885 Mill. This diminution is due to the fact that last year, the Reservoir works were practically completed.

I will now describe the progress made by the General Services in 1903, separating my Report into two portions, viz, "Irrigation Works," and "Works other than Irrigation."

## Part I.—IRRIGATION WORKS IN 1903.

## THE SEASON AND THE WATER SUPPLY.

In consequence of the effect upon the river, below the Aswan Dam, caused by the filling and discharging of the Reservoir, the gauge at Aswan can no longer be made use of during the summer months as a standard of comparison with the river levels of previous years. In future, the gauges at Khartum and at Wadi Halfa will be referred to in any comparative statements of the kind.

The years 1900, 1901 and 1902, were distinguished by abnormally low summer levels, followed, in each case, by a partial failure of the flood. At the commencement of last year, it appeared probable that 1903 too would be included in the same category as its immediate predecessors, namely as a year of bad supply. On the 1st of January, the level at Khartum was only 26 centimetres higher than that recorded on the same date in the years 1900 and 1902, and was 10 centimetres lower than the reading in 1901. At Wadi Halfa, the water levels were not much better. Although the gauge reading on the 1st of January 1903, was 86 centimetres higher than that of the 1st January 1900, it was only 4 centimetres above that for the same date in 1901, and only 12 centimetres higher than the level recorded in 1902. Consequently, the year 1903 commenced with a river level considerably below the normal. For several months the conditions continued to be unfavourable, going from bad to worse, until on the 17th of May, the Khartum gauge recorded a reading 10 centimetres lower than the lowest level reached in the minimum year of 1900.

Fortunately, from this date matters began to improve, and a steady rise commenced. This was continued until, on the 29th of May, the level for the same date in 1899 (a year of fair summer supply but of poor flood) was passed. On the 18th of June, a check occurred in the rise which was followed by a slight fall. On the 1st July, the true rise commenced at Khartum.

The flood, however, during the earlier stages, was extremely slow in rising; so much so that, during the first half of the month of August, everything appeared to point to a failure of the Nile flood for the fifth year in succession. By the 15th of August, a great improvement took place and, by the end of that month, the levels at Wadi Halfa were those of a fairly average year. The fall, after this date, was a gradual one and, by the end of 1903, the gauge at Halfa was nearly 40 centimetres higher than that for the last days of the year 1902.

The year 1903 may be briefly described thus: Throughout the winter and early summer months, the levels were exceptionally bad, but a timely rise in the middle of June improved matters considerably. In the first stages of the flood, the water levels were much below the mean of previous years, but, towards the end of August, they rose so quickly that those of a fairly average year were attained. The flood, however, must be classed as a late one. The fall was so gradual that the year closed with a better prospect for the supply of the following summer, than had been the case for several years previous.

The maximum gauge reading at Khartum in 1903, was reached on the 31st of July, and at Wadi Hulfa on the 25th and 26th of August, when 8.20 was recorded on the gauge.

## ASSISTANCE RENDERED BY THE ASWAN RESERVOIR.

Throughout the period of low snumer supply and, whilst the khartum levels were at their lowest, the discharge of the river, north of Aswan, was supplemented by the water from the Reservoir, to such an extent that no difficulties, as regards irrigation, were experienced, and but few people in Egypt were aware of how critical at one time the situation promised to become. By the 1st February 1903, the maximum water level, viz R.L. 106.00, was reached in the Reservoir. From that date, until the 10th of March, it was kept full and the river supply was passed through the upper shrices. On the 10th of March, in consequence of the low levels of the river, it was decided to commence supplementing the discharge, by the water stored in the Reservoir.

The following cubes of water discharged and added to the river supply:—

From	March	10th	to	Marc	h 26th	1	million	enhic	luetres	faire.	diam
0.0	0+	26th	• 4	May	1-1	2				Inc. 1	4414.111
0.0	-48:13	105	7.6	0.4	20111	4	10	14	94		
	0.0								71		
••	June	Brd	07	**	25th	20	90	**	**		

By the end of June, the first rise from the south reached Aswan, and thus maintained the river levels downstream of the dam. Previous to this date they had been artificially kept up by the water from the Reservoir. The discharge of the Nile in June, was only some 20 millions of cubic metres per diem. The Reservoir water therefore practically doubled the available supply, at the most critical period for

the irrigation of the summer crops.

The filling and discharging of the Reservoir involves an immense amount of work in the shape of calculation, diagrams, etc., besides constant watching of the river levels and very careful manipulation of the sluices of the dam. Considering that the year 1903 was the first in which the Reservoir was made use of, and that there had been no previous experience to guide them, great credit is due to Mr. Webb. the Inspector General of Irrigation, Mr. May, the Resident Engineer and the whole staff, for their very successful regulation of the supply. With the abnormally low levels and the totally inadequate supply in the river up to the middle of May, there would have been great difficulty in saving the summer crops, had it not been for the assistance afforded by the water stored in the Reservoir. This enabled an ample supply to be given to Middle and Lower Egypt, at least one month earlier than would have been possible had the dam not existed. Canal rotations were relaxed generally early in July, instead of in the middle of August. The prohibition against the irrigation of land for the maize sowings was removed one month earlier than the usual date. Rice irrigation was permitted everywhere and the entire cotton crop was plentifully watered. Lastly, some 170000 feddans of land in Middle Egypt, formerly basin, were given "Sefi" irrigation. The rental and sale value of these lands was consequently largely increased.

Measures taken in 1903, to ensure Water distribution.

The Asynt Barrage was closed on the 21st of February. The maximum "head" attained on this structure was 1.11 metres. It

was fully opened by the 9th of Angust.

The Delta Barrages were tightly closed by the 10th of April. Up to the first week in June, the supply in the river, upstream of these structures, slowly diminished. After that date, the influence of the Reservoir water was felt and the supply steadily increased. By the 3rd of July, the level of 15.50 metres upstream was reached. This is an all-important level, as regards Lower Egypt, as, until it is reached,

no water is passed down the branches of the river below. It is the maximum level permitted, with all the gates closed. In previous years this maximum has rarely been attained until a month later and it has often been as late as the middle of Angust. The effect of the Reservoir, combined, it is only fair to add, with an early rise in the south, was to reduce the period of tension to some 38 days, as against from 70 to 110 days in previous years of similar supply.

The earthen "sudd" in the Damietta branch was not constructed in 1903. That in the Rosetta branch, was made as usual. This "sudd" was completed by the 20th of May. A total quantity of 80 millions of cubic metres of water was drawn from the pool upstream of this dam. This was sufficient to give two waterings to m area of some 100000 feddams.

The Atfeli pumps were worked for a total period of 22 days. These pumps are used to supplement the supply of the Mahmudiyeli canal.

Summer rotations were commenced in Lower Egypt, on the 15th of May. They were removed everywhere, by the 21st July.

Flood rotations, by which alternate periods of high and low supply are given to every reach of the canads, were enforced from the month of August. These rotations have an excellent effect in preventing the flooding of the drains and the consequent swamping of the adjoining lands.

## IRRIGATION EXPENDITURE IN 1903.

#### TABLE I.

#### ORDINARY BUDGET.

Central Office Civilinian and I	I. F.	35.
Central Office (including supplementary Reservoir expenditure) Upper Egypt. Lower Egypt.	76769	057 755 100
Total 1		
TABLE II.		
Extragrdinary Burget.		
Ziftah Barrage (Caisse),	1.h. 18599	n. 079
Irrigation improvements (Chisse)	73313	807
New Weirs (Caisse)	. 479843	815
Total	L.E. 651756	731

#### TABLE III.

### VARIOUS SPECIAL CHEDITS.

			Tot	al	 L.	E. 17736	570
Barrage Gardens	**	• • •				1055	
Rosetta & Damietta "sudds"	20				 	8237	
Special Low Flood eredit	0.0				 	2954	
Special Low Nile Works (	Caisse)				 • • •	5488	599
						L.E.	31.

The figures in these three tables, added together, give the total expenditure upon Irrigation Works for the year.

#### TABLE IV.

TOTAL	EXPENDITUR	E, 1903.
-------	------------	----------

						L.E.	M.
Ordinary Budget	***	 		 		618783	
Extraordinary Budget		 		 		651756	
Various special credits.		 	* * *	 * * *		144-00	3770
		T	stal	 •	L.E.	1288277	213

This is less than the expenditure, under the same heads in 1902, by L.E. 154835.670 Mill.

The foregoing may be subdivided as follows:-

#### TABLE V.

	Las Pas	201 1
(g) Regular Duuger	201060	
(b) Corvée Relief (Caisse)	249999 150596	199
(c) Corvée Relief (Finance)	12753	
(e) Special credit for Bridges to replace Ferries	4401	161
Total LE	.618783	912

(a) The item "Regular Budget" in Table V, is again subdivided thus:—

#### TABLE VI.

			Lastin	AL,
Establishment			80211	844
Contingent charges			20509	597 981
New Works		•••	711414	493
Maintenance and Repairs Khatatheli and Atfeli Pumps			4 7 (1)	()()()
Drainage of Lake Marcotis			10000	000
Land charges			1201	903
Supplementary Reservoir expenditure	***	* * *	45.51.15	000
Etsa Pumping Station				579
	Total	***	L.E. 201060	1113

The total of this last table is very similar to that of 1902.

# (b & c) TABLE V.—Corvée Relief.

These items call for but few remarks. The distribution of the credit furnished by the Caisse was the same as that of 1902. The credit supplied by the Ministry of Finance was, as usual, distributed according to the necessities of the different provinces and irrigation circles, in which Corvée relief works were executed. The following table shows a subdivision of the Corvée expenditure.

TABLE VII.
CORVÉE ABOLITION.

Corver Arotation	Upper Egypt.	Lower Egypt.	Total.	
	L.E. M.	L.E. M.	L.E. M.	
Caisse money { 1902   1903			249999 370 249999 119	
Regular Budget $\left\{ \begin{array}{lll} 1902 \\ 1903 \end{array} \right.$	30302 715 31357 359		150808 188 150569 827	
Total L.E. { 1902   1903	158302 715 159357 539	242504 843 241211 407	400S07 558 400568 946	

## (d) TABLE V.—AGRICULTURAL ROADS.

The following shows the work done and the expenditure incurred:-

Locality,	Length of raids existing previous to 1903.	Length of new roads constructed in 1903,	Expanditure in 1903.		
Upper Egypt and the Fayma	638 · 1800 · 40	Kilometres. — (land) 63·100	12749	M. 479 747	
Totals	2438 • 10	(13-100)	12753	226	

The apparently excessive expenditure in Lower Egypt, is almost entirely due to the payment of bills for land taken up in the year

previous, but unpaid for, owing to delay in the preparation of the registers.

## (e) TABLE V.—Bridges to replace Ferries.

The total expenditure under the Caisse grant in 1903, was L.E. 4401.161 Mill.

For this money, four bridges were put in hand, two in Upper and two in Lower Egypt. Of these, three were completed and the fourth is under construction.

In Behera Province, an iron bridge was commenced at Khatatbeli to replace an old bridge, L.E. 1000 was expended upon this work in 1902, but it will require a further sum of L.E. 1600 to complete it.

In the Girga Province, 19 timber bridges, on masonry abutments and piers, were built at a cost of L.E. 9420. These bridges were paid for by the landowners themselves, a tax having been imposed (voluntarily) upon the cultivated area of the Province in order to find the funds required.

Out of the 49 bridges voted by the Provincial Girga Councils, 33 have been completed up to the end of 1902.

#### THE ZIFTA BARRAGE.

This work was completed early in 1903, and inaugurated by His Highness the Khedive in the mouth of March. The subsidiary canals, taking off right and left of the river above this work, were not sufficiently advanced to enable full advantage to be taken of the Barrage during the summer months. Nevertheless, it played a useful part at a very critical moment. It was regulated upon throughout the summer, and yielded small supplies to the Ravyah Abbas for short intervals during the rotation periods. The great service rendered by this work, however, was during the important time when the flood was first rising. The effect of this first rise is generally very slowly felt, and, as every feddan of land in the upper reaches of the canals is taking water at that moment, the tracts to the north, particularly in northern Gharbich, suffer severely by the delay in the arrival of the extra supply. In 1903, water was passed down the Damietta branch, between the 3rd of July and the 14th of August, in sufficient quantity to enable the Rayvah Abbas, by means of the Zifta Barrage, to feed the Bahr Shebin. The water taken from the river upstream of the Delta Barrage, was

thus used for the irrigation of the southern area of the Delta, while the northern tracts derived their supplies from the Zifta weir. The effect was to increase the water supply of the 2nd Circle of Irrigation by 30 per cent during the latter half of July, and throughout August. This permitted the early abandonment of the rotations, and largely assisted the sowing of maize and rice.

## "SHARAKI" IN 1903.

The area left unirrigated was a small one. The final returns have not yet been received, but it is not expected that the total will exceed 5000 feddans, all of which is upon islands, or on high foreshores of the river.

#### CROPS.

The winter crops, both in Upper and Lower Egypt, were generally good.

A very large area was planted with cotton in 1903, and at one time, a record crop appeared probable. There was no shortness of water, but, unfortneately, the same unfavourable climatic conditions were reproduced, which had reduced the yield for several years in succession. These conditions were, a low temperature and fogs during the month of September. In spite of this, the crop was a fairly good one and the latest estimates give the probable out-turn as 6500000 kantars. The price, throughout the season, was exceptionally high.

The maize crop, although affected by the cool weather was a pleutiful one.

The cultivation of rice was practically unrestricted, and a very large area was planted with this crop.

The final returns from the sugar Factories in Upper Egypt are not yet to hand, but the sugar-cane crop is reported to have been an average one.

With regard to this last crop, it must not be forgotten that, at present prices and even with a considerable reduction, cotton is far more profitable to the landowner than sugar. Unless then there should be a ruinous fall in the price of cotton, an increase in the urea of this crop may be expected in the tracts formerly devoted to sugar-cane, and a corresponding decrease in the area planted with the last-named crop.

THE RISE IN THE VALUE OF LAND IN MIDDLE EGYPT.

Throughout Egypt, there has been a very marked increase in the sale value of all land, but in Middle Egypt, this rise has been especially apparent, in consequence of the increased rental obtainable for land converted from basin to perennial irrigation. This result, although highly satisfactory to the land-owner, is scarcely so much so to the Government, as it has produced a very scrious addition to the cost of the conversion works.

The construction of the new canals and drains has necessitated the purchase of considerable areas of land by the Government. These works have been carried out in each province in succession, commencing with Asynt. Thus, when the conversion of one province was completed, work was commenced in that next to it and to the north of it. The Province of Asynt was first taken in hand as being the nearest to the head of the Ibrahimieli Canal, which takes off above the new Asynt Weir. When Asynt was completed, work was started in the Minieh Province, and after Minieh, will come Beni-Suef, and last of all Ghizeh.

The results obtained by the conversion works in Asynt were so satisfactory, as regards the yield of crop, etc., that the landowners in the Province of Minich auxiously awaited their turn for reaping similar benefits. As soon as it was known that the works were to be commenced, the value of land in Minich rose throughout the district. As this enhanced rate applied to the land required for the new canals, etc., equally with all other land in the province, the Government found itself in the anomalous position of being obliged to spend considerably more money upon the construction of the very works to which this increased value of the land was due, than would have been the case, did these works produce no benefits to the landowners whatever. In other words, the Government, by spending large sums, increases the productiveness of the land. The proprietors, well aware of this, and equally well aware that land for the necessary works must be purchased from them, denand a rate for it, based upon its prospective value when these works shall have been completed. Thus, those who will eventually reap the benefits, make their benefactor pay heavily for the privilege of bestowing such benefits upon them! Such a result could scarcely be arrived at in any other country than Egypt.

The only remedy would appear to be the suspension of these works, until an arrangement could be come to with the landowners that they

should give the area of land required at a reasonable rate. Such a suspension is undesirable, as it would defer the realisation of the increased revenue to be obtained from the conversion of the basins, and the people are well aware that it is not likely to be put in force.

The following figures show the cost of the conversion works (per feddan benefitted), as executed, compared with the original estimates:—

I.—Asynt Province:	LE	м.	
Original estimate	2 3	005 per 233	feddan.
II.—Minich Province:			
Original estimate	3	153 556	44
III.—Beni Suef and Ghizeh Provinces:			
Original estimate	.1	000	17

As the work in these last is in progress, the actual cost is not yet known.

It will be observed that, warned by the excess in the cost of construction in No. I, when the estimates for No. II were framed, a considerably increased rate was allowed for. Even this was insufficient, and for No. IV the original rate per feddam (for Asyut) has been doubled in the estimates!

Although the price of land is chiefly responsible for the enhanced cost of the works, it is only fair to state that increase is not entirely due to this cause. Owing to the expansion of "Sefi" cultivation in Middle Egypt, labour is now more difficult to obtain, and costs more than was formerly the case. It is now difficult to obtain ordinary labour for less than P.E. 5 per diem, whereas, a year or two ago, it could be easily got for a rate of P.E. 3 per diem. This has naturally produced a corresponding increase in the cost of all classes of works.

In the figures given above, representing the cost of the conversion works, per feddan of land benefitted, the expenditure upon the widening of the Ibrahimia Canal (the main supply channel for Middle Egypt) and the remodelling of the main drain with its pumping stations upon the Nile, has not been included.

If the figures for these works he added to the estimate, then the total cost of conversion, for the 451,000 feddans of basin in the four provinces, will come to L.E. 3,200,000, or some L.E. 7 per feddan of land converted. It will thus be seen that the process of conversion is

a costly one, and it may well be asked whether such an expenditure is warranted.

The results obtained, so far as they go, give a satisfactory reply to such a question.

Up to the end of 1903, some 170,000 feddans of basin land have been converted to perennial irrigation. Assuming the total, final cost, as distributed over the whole area, to be L.E. 7 per feddan, the proportional expenditure, for the area already converted, will be L.E. 1.190,000.

The gain to the landowner has been, that his annual rentals have increased by at least L.E. 3 per feddan, and the sale value of his land has risen by at least, L.E. 40 per feddan. In other words, for an expenditure of L.E.1,190,000, the annual rental of 170,000 feddans, has been increased by L.E.510,000, and the present sale value, by a sum of L.E. 5,100,000.

The gain to the Government will lie in the special rate of P.E. 50 per feddau, which will be levied on the converted lands, in a few years' time. When this rate falls due, the Government, on the area of 170,000 feddans will receive an additional annual revenue amounting to L.E.85000.

Before these works were undertaken, it was feared that the cultivators of Middle Egypt, having been accustomed to basin irrigation for many centuries, would be slow in adapting themselves to the new conditions. The contrary has been the ease. Although short of cattle for agricultural purposes, the readiness with which they have availed themselves of the "Sefi" water, has been very satisfactory.

## THE MEX PUMPS.

The cube of water raised, by these pumps, from Lake Mareotis, and passed into the sea at Mex. was, in the winter of 1902-1903, =346,420,022 metres. This amount is the maximum as yet recorded in any one season's work. It is greater than that lifted in the previous year, by some 11,000,000 cubic metres. The increase is due to the heavy rainfall on the sea-coast in the winter of 1902-1903. The cost of pumping last season fell to a rate of L.E. 32,205 per cubic metre of water lifted, as against L.E. 34,548 for the year before. In spite of this satisfactory result, which is due to good management, the total charge for pumping in 1903 was over L.E. 13000. This is a very heavy charge upon the Irrigation Budget.

## NEW WORKS AND REPAIRS IN 1903.

## (a) UPPER EGYPT.

PROVINCES OF ASYUT, MINIEH AND BENT SUEF.

The following were the chief items of expenditure:-

Works connected with the conversion of the basins. The total cost in 1903, was L.E. 399000.

For this sum, 733 kilometres of canals and drains were constructed. The works included 386 masonry works and nearly 12 millions of metres cube of earthwork.

#### THE FAYEM PROVINCE.

Some L.E. 65000 was spent upon remodelling works (canals and drains) connected with the Reservoir. This represents construction of channels for a length of 194 kilometres.

In addition to the above, 14 miscellaneous new masonry works were constructed, and 69 others were repaired, at a cost of nearly L.E.19000.

7.6 millions of cubic metres of earthwork were executed for a sum of L.E. 100000.

### THE ASWAN RESERVOIR.

The final certificate, amounting to £3,320,272, was paid to Messrs. Aird & Co., the contractors, on the 4th of April 1903, in settlement of all acounts.

This is thus divided:—

Cost of the Aswan Dam Asyut Barrage	 	***	*** **		***	2,424,797 895,475
			Tota	d		£3,320,272

## NEW LOCK SOUTH OF ASWAY DAM.

In order to assist mavigation between the dam and the town of Aswan, it was found necessary to construct a new lock, (making the fifth in the series) at the Sahel cataract. This work, which was commenced in the winter of 1903 was successfully completed before the flood of that year. The cost was L.E.49382.

#### (6) LOWER EGYPT.

The following, were the principal works carried out in 1903.

A sum of L.E.179000 was expended upon new works in connection with irrigation improvements.

The chief heads of expenditure are as follows:-

The Zifta Barrage, the Ismailia Canal head and lock, the Nagail Canal project, the Kasheb Canal project and sundry large regulators.

### THE ZIFTA BARRAGE.

The completion of this work has entailed a total expenditure of L.E.420079.

The amount is thus subdivided:—

The Barrage proper	 * 4 *	 * * *			 14E. 286120 99035 34924
			Total	l	 L.E.420079

Of the above, L.E. 89839 was expended in 1903.

## THE ISMAILIA CANAL HEAD AND LOCK.

This work was completed in 1903, at a total cost of L.E.62416. Through navigation between the Nile, the Ismailia Canal and the Snez Branch has thus been re-established.

#### THE NAGAIL CANAL PROJECT.

This is an important scheme for improving flood irrigation in the Province of Menufia. The total expenditure up to date has been some L.E.24000, of which L.E.11000 was expended in 1903.

#### THE KASHEB CANAL PROJECT.

L.E. 6800 was spent upon remodelling this, the main irrigation channel for 40000 feddans in the Ghizeh Province, on the east bank of the river.

#### REMODELLING SUNDRY LARGE REGULATORS.

· The works put in hand in 1903, were the regulators of Bugaria, Sirsawia, Basinn and Qodaba. All these are important works. The expenditure was L.E.5500.

In addition to the above expenditure, a large number of remodelling works, for the improvement of water distribution, were carried out in every province in Lower Egypt.

137 kilometres of new channel were constructed, and some 8½ millions of metres cube of earthwork were executed. This last item represents

an expenditure of L.E.179000.

## DRAINAGE WORKS IN LOWER EGYPT.

165 kilometres of new drains were constructed in 1903 at a cost of L.E.83552.

This sum includes the cost of several very large masonry works in the shape of drainage syphons, etc.

## SPECIAL CREDITS FOR LOW NILE.

The following was	the expenditure:—
-------------------	-------------------

						LOW NILE	Low F	1.000
						1.45. M.	L.E.	M.
Upper Egypt.	***	 104				Nil	1577	666
Lower Egypt.		 				5488 969	1319	903
Central Office		 		- • •	• • •	Nil	57	296
		l'otal	S	• • •	L.	E. 5488 969	2954	865

## RIVER PROTECTION.

Expenditure	in	Upper	Egypt	• • •	***	• • •	***	* * *	 		3479
••	99	LOWER	rable	* * *	* *		* * *		 		27821
						*	l'otal		 • • •	L.E	.31300

## BASIN BANK PROTECTION.

On reverment works, a sum of L.E. 5968 was expended in 1903.

## The Nile Corvée in 1903.

The following are the figures:-

Izeatity		07 313	NUMBER IN FOR 101 DAYS
Upper Egypt Lower Egypt	*** ***	• • •	10703 541
	Total		11244 men for 100 days

In both localities, the numbers are very much less than for previous

years of similar flood levels.

Mr. Verschoyle, the Inspector General of Irrigation for Lower Egypt, is of opinion that the policy of reducing flood watchmen in the Rosetta and Damietta branches of the Nile, and in Ghizeh, has been rather overdone during the past few years. The banks, which have been deprived of their protection of stakes and brushwood, have sufferred from wave-action. This will entail a considerable expenditure in repairs.

## THE "SUDD" IN THE BAHR-EL-GEBEL.

No work was done, as regards the clearance of this obstruction, during the winter months of 1902-1903. In the latter part of 1903, however, an expedition under Lt. Drury, R.N., attached to the Sondan Service, started with the object of completing this work. Unfortunately, his serious illness at the moment when the work was well advanced prevented its completion.

## EXPEDITION TO STUDY THE NILE SOURCES.

In December 1903, two expeditions started for the above purpose.

The one visited Lake Tsana, the source of the Blue Nile, and the other the Lakes Victoria, Albert Edward and Albert, which, with the Sobat and the Bahr-El-Ghazal, constitute the sources of the White Nile. Both missions returned to Egypt in the spring of 1903, and the Reports

will be published early in 1904.

## NILE GAUGES IN THE SOUDAN.

The following new ganges were erected in 1903:-

White Nile.

Gondokoro, Mongalla, Taufikin and Ghaba Shambé.

Sobat.

Nasser and Doleib Hilla.

Atbara.

Khashem-El-Girba.

## LAKE VICTORIA NYANZA GAUGE READINGS.

The rains at the end of 1902, in the neighbourhood of Lake Victoria, were heavier than in 1901. The lake level began to rise in December 1902 and continued to rise until July 1903. It then fell until October, when a fresh rise commenced. According to the latest information, this last rise has been continued. Unless the rains in April and May 1904, should fail, the mean level of the lake will probably be higher in 1904 than has been the case for several years past.

After the almost continuous fall in the mean level of Lake Victoria from 1896 (when regular readings commenced) until 1902, the present year has seen a marked improvement. The following table, compiled by Captain Lyons, Director General of the Survey Department, shows the variation in the mean level of the lake, deduced from the gauge readings, as corrected by him.

Mean lake levels in metres.

SITE	Years.										
1117	1896	1897	1898	1899	1900	1901	1902	1903			
Kismmu	0.928	-		0.733	p-391	0.208	0.172	0.731			

The readings for 1897 and 1898, for Kisumu, are incomplete. These figures show that in 1903, in the seventh year after the series of six low years, the lake level has risen again.

## THE STAFF IN 1903.

The Irrigation Service suffered a loss in the retirement of Major Sir Hanbury Brown, in April of last year. For nearly twenty years he devoted his services to the improvement of irrigation in Egypt, and numerous works testify to his labours in this direction. Among the more important may be mentioned the restoration of the Delta Barrage, with its subsidiary weirs, and the Zifta barrage, the last work being completed shortly before he left the country.

His knowledge and experience of irrigation were exceptional.

On Major Brown's retirement, Mr. A. L. Webb became Inspector General of Irrigation in Upper Egypt and Mr. K. Verschoyle was appointed to the similar post in Lower Egypt. Owing to the completion of the Nile reservoir works, the post of Inspector General of Reservoirs was abolished.

The entire staff worked hard and well and a very successful year bears witness to their labours.

The two Inspectors General of Irrigation, Messrs. Webb and Verschoyle, need no words of praise from me. The good results obtained last year are entirely due to their labours and to those of the Inspectors of the different irrigation circles, who again were ably seconded by a very competent staff.

## Part II.—WORKS OTHER THAN IRRIGATION.

## L-THE TOWNS AND BUILDINGS SERVICE.

The following tables show the sums expended by the above service during the year 1903. They are merely an amplification of the details of the total expenditure, as recorded upon pages 4-6 of this Report.

The following was the general distribution:-

(a) Ordinary Budget (b) Special funds granted by Caisse (c) Special funds from other Departments (d) Special works under revenue	1.E. 213029 106076 46414 11797	440
Total IE.	377317	797

This total shows an decrease in expenditure over that of 1902 amounting to L.E. 81840.726 Mill.

The four items in the first table are thus subdivided:-

## (a) ORDINARY BUDGET.

<ol> <li>General Direction</li> <li>Public Buildings</li> <li>Cairo City</li> <li>Provincial Towns</li> <li>Gas</li> <li>Esbekich Gardens</li> </ol>	• • •	***	• • •	***	• • •	***	4 0 0	22150 85565 33237 48385 21301 2388	000 927
								2.388	

The total is more than that for 1902 by L.E. 2114.924 Mill. I will briefly discuss the different items:—

# (1) General Direction.

This calls for no special remark. The sum represents the salaries of the permanent staff and is more than that expended in 1902 by L.E. 444,446 Mill.

## (2) Public Buildings

The following is the distribution of expenditure:-

	L.E.	м.
Temporary staff	830	000
General charges	4367	650
Materials and plant	910	073
New works	8215	
Repairs and maintenance	71212	1100
Total L.E	35565	650

Or, more than the expenditure in the previous year by L.E. 7285.288 Mill.

## (3) Cairo City.

					1., E.	M.
Temporary staff	 	 		 	736	000
General charges					\$39	165
Plant and materials					1139	
Transport of materials					7.336	
New works	 	 		 	3138	
Repairs and maintenance	 	 		 	19697	200
•		FRI	1	1 1	1 90097	711
		Tota	1	 \$ 3. 87	32237	1:11

## (4) Provincial Towns (Local Commissions.)

							lee lie	ы.
Temporary staff			 			 • • •	642	(000)
174							9127	889
Materials and plant								(3(3()
New works							198	
Repairs and mainten	ance	9	 			 	46611	375
•								
				Tal	23.		L.E. 48385	13(30)

The sums in the above table are expended by the local Committees of the provincial towns. These, again, are controlled by a permanent Superior Commission at Cairo, which examines all proposed expenditure, exceeding a certain fixed amount.

## (5) Lighting.

#### (a) Gas.

The total number of gas lamps, in Cairo, at the end of 1902, was 3500; no addition was made to this number in 1903;—6500 more lamps are argently required in the native quarters of the city. This would entail an expenditure of L.E. 43800.

The fines levied against the Gas Company for defective light have decreased by some 50°/<sub>o</sub>. This is largely due to the better quality of the gas supplied.

The Gas Laboratory, under the Public Works Chemist, was opened in April 1903, and tests to control the illuminating power, the purity and the pressure of the gas supplied by the Company, were commenced on the 4th May of last year.

In accordance with the agreement made, the Gas Company has commenced the installation of "incandescent" burners, at its own expense, to replace the old "flat-flame" burners. Up to date, 500 lamps have been fitted with the new burners. The result is very satisfactory and is a great advance on the old system.

## (h) Electricity.

7740 metres of new cable were laid in Cairo during 1903. 53600 incandescent lamps of 10 cmdles power were put up.

The towns of Helwan. Ismailia and Mansura are now lighted by electricity.

Rules and regulations governing all electric installations have been drawn up and will shortly be published.

## (6) The Ezbekich Gardens.

In 1903, the receipts were L.E. 1263.382 Mill, while the expenditure was L.E. 2388.169 Mill.

## (b) Expenditure under Special Credits granted by the Caisse de la Dette.

Nº Ti 1 1 1 1 1	L.E.	M.
New Egyptological Museum	16399	265
Clearing front of above	938	213
Aspladt paving Cairo streets	14099	483
Repairs to ancient monuments		-1:31;
Sundry new buildings	71747	(113

Total... L.E. 106076 440

# (c) LIST OF WORKS EXECUTED UNDER SPECIAL FUNDS PROVIDED BY OTHER DEPARTMENTS.

							L.E.	36.
Delingat Markaz							1796	500
22 A. F. T.			• • •	•••			538	783
FF 1 1 1		• • •	* * * *				652	614
T21		• • •	***	***			2093	112
		* * *				• • •	9999	266
Polytochnic School					• • •	* * *	2288	333
Arabic Museum furniture			4 = 0	* * *			252	(12.)
Agricultural School		***		• • •			1423	857
Fayum Tribunal		0 + 0					999	226
Aswan Tribunal	• • •	• • •			* * *		11685	390
Ras-el-Tin Palace			* * *			* * *	3000	000
Ras-el-Tin School								000
Tahta Tribunal						0 0 0	640	
Sundry small buildings							4499	033
Achievement Arabic Museum		* * *					4682	535
Cairo Girls' School				0.0 b		***	789	441
Mohamed-Aly School							641	381
Mansura School			0 0 0				575	386
Opera House							562	901
Fire-engine room at Girga							534	635
Bulae Printing Office							468	585
Land for Mansura Tribunal							444	()(1)()
Repairs to Polytechnic School							367	860
Cemeteries in provinces							360	619
Kasr-el-Nuzha School							360	000
Fire-engine rooms			***				270	264
Transport of Giza Palace roof							200	(10)(1
Works under L.E. 200.							2.50	261
THE PROPERTY OF THE PARTY OF TH								
			Tot	al		1	E. 46414	403

# (d) Special Works coming under the head of "Revenue."

Cairo City Public Building Revenue Provincial Towns Ezbekieh Gardens	• • •	 	 •••	 	9087 2414 293	
					11797	696

#### NEW WORKS.

No works of any very special magnitude were under construction in 1903.

21 different buildings were completed in different parts of Egypt, consisting of schools, courts of justice, Police barracks, Government offices, etc.

The total cost of the above has been L.E. 96638, of which L.E. 50114 was expended in 1903.

In addition to the above, 10 other works of the same nature were under construction during the year and are not yet completed. The expenditure for the year was L.E. 21495.

## REPAIRS.

A sum of L.F. 45401 was spent upon the repairs, small and great, of 567 Government buildings. Of these charges the heaviest was the roofing of the Ras-el-Tin Palace, upon which a sum of L.E. 14500 was expended in 1903.

#### THE CAIRO ROADS.

A sum of L.E. 12229 was spent in 1903 upon the upkeep of 490950 square metres of road. This area represents only 17% of the total road surface of Cairo.

In addition to this L.E. 17305 was expended upon the construction of asphult roads in the native quarters of the city. The experiment has been entirely successful, and is to be continued in 1904, another grant of L.E. 20000 having been accorded for this purpose by the Commissionners of the Public Debt.

## TELEPHONES.

Telephonic communication between Cairo and Alexandria was opened in May 1903.

## THE CAIRO TRAMWAYS.

The new line to Shubra, a length of 4868 metres, was opened for traffic last year.

The number of people using these means of communication is steadily increasing as the following table shows:—

YEAR 1901							nı"	PARSEN	NUMBER COERS FOR THE YEAR.
1902	4 8 4	 	* * *				 		14714667
1903								* * *	16926050
A a'll ly F	* * *	 0 * 0		***	* * *	* * *	 * * *		18957167

## NEW BRIDGE ACROSS THE NILE AT CAIRO.

Tenders have been invited for the construction of this bridge. It will cross the Nile m Roda Island, and the length of the roadway will be 535 metres. The tenders will include offers for the construction

of two smaller bridges across the Roda channel. Enquiries regarding specifications, etc., have been received from well known firms in England, France, America, Germany. Belgium and Switzerland. The latest date upon which tenders will be received is the 1st of February 1904.

## WATER SUPPLY OF PROVINCIAL TOWNS.

Small water-works exist in 14 towns, not including the more important installation at Tanta. Installations upon a larger scale are projected at Zagazig, Mansura, Menuf, Shebin-el-Kom, Damanhur and Damietta.

#### THE STAFF IN 1903.

Mr. Perry has, as always, devoted his entire energies to the administration of his Service and has reason to be satisfied with the results of his year's work. He brings forward the names of certain officers of his Staff for special mention, and I cordially endorse his words of praise regarding each one of them.

## H.—THE SURVEY DEPARTMENT.

The following Table shows the expenditure for last year :-	
190	)3
I.I.	M.
Permanent staff 10105	693
General charges	539
Geological survey	682
Geological survey	728
Reproduction of maps 2459	720
L.E.62742	352
This total is again subdivided thus :-	
1902 190	03
L.E. M. L.E.	ж.
Allotment in Public Works Budget 34005 912 32485 Allotment given by Finance Ministry	352
for the Revenue Survey 20173 000 30257	000
Total L.E.54178 912 62742	352

The expenditure for 1903 exceeds that for 1902 by L.E.8563,440, The increase being in the allotment made by the Finance Ministry for the Revenue Survey.

Captain Lyons goes into considerable detail regarding the working of his Service and his report is full of interesting matter. I am unable to do more than very briefly allude to the main points of interest in his note.

#### THE REVENUE SURVEY.

The Provinces of Kaliubia and Dakahlia were completed in the year 1903. The survey of Kena Province was begun. The whole of the Delta has now been surveyed for Revenue purposes.

Captain Lyons makes a good suggestion with reference to the maps deposited with the land registers at the Mudirias. Sales of land are constantly taking place, but, at the Mudirias, there is no accurate system of keeping these maps up to date and thus the map may, in a few months, no longer represent the actual state of the properties, and the mutation register, not being properly kept up, is of no use in revision of the map. He suggests that an annual expenditure of L.E.2,000 be granted for the purpose of keeping these maps up to date by means of a cadastral office in each Mudiria, controlled by the Survey Department. The proposal seems a good one and, if the registration of title deeds is ever introduced, some such arrangement will be necessary.

## MAPPING DEPARTMENT.

The sale of maps and publications is steadily increasing. In 1903, a sum of L.E.1721 was thus collected.

In the same year 122817 maps and 30904 publications were issued free of charge to the Government Departments, while 13071 maps and 1648 publications were sold.

## TRIANGULATION.

In 1903, the major triangulation of about one-third of Kenn and Girga and of Aswan, from Dabba northwards to Esna, was completed.

Base lines were measured at Addedan, Dabba and Khattara and another at Tema for the Girga triangulation. Captain Lyons describes the methods of measurement.

The cost of major triangulation was L.E.2065, for which some 4100 square kilometres were triangulated.

#### FIELD SURVEY.

752000 feddans were completed in 1903, which is the largest area yet completed in any one year. It is satisfactory to learn that there has been a steady reduction in the cost per feddan during the last two years, both in field and record work.

#### Topographical Maps.

Owing to want of funds, progress with this most useful work has been but slow. It is much to be hoped that an increased credit may be obtained in the future. Such maps are invaluable to the Irrigation Service, more particularly as regards the study of new projects.

#### THE GEOLOGICAL SURVEY.

Some of the staff was employed, at my desire, in measuring the discharges of the White and Blue Niles for several months of the year. In 1903, Mr. Barron reviewed the geology of the country between Cairo and Suez, while Mr. Beadnell continued the collection of fossil remains from the upper Eocene beds near the Fayum. Dr. Hame was occupied with the arrangement of the museum collections.

During the year, reports on a portion of the eastern desert and on the Baharia Oasis have been published.

An arrangement has been made with the British Museum authorities, by which the latter will publish in a monograph a full description of the whole of the fossil remains from the Fayum, collected during the last few years. This monograph will include the material existing both in Cairo and London.

#### METEOROLOGICAL DEPARTMENT.

New stations were equipped in 1903 at the following stations:-

At Mongalla and Ghaba Shambé on the Bahr-el-Gebel;

At Wan on the Bahr-el-Gazal;

At Doleib Hilla and Nasser on the Sobat.

Captain Lyons gives a list of all the stations now existing in Egypt, Abyssinia and the Soudan.

## THE CAIRO OBSERVATORY.

The transfer of all the instruments from Abbassia to Helman took place at the end of the year. In consequence of their pending move, no new work was undertaken in 1903.

## THE LABORATORY.

The record of work for the year, under the able direction of Mr. Lucus, was very satisfactory. In the chemical section, 288 analyses were made during the year.

In the physical section, 111 samples of cement and hydraulic lime were tested for tensile strength, etc., while 162 samples of brick and

building stores were tested for crushing strength, etc.

The section of weights and scales.

A certain amount of work was done in 1903 for the Government Department.

The gas testing section.

Regular and systematic testing of the Cairo gas was carried out last year. A complete set of the apparatus having been received and erected at the beginning of 1903. This apparatus is exactly similar to that at present used in Paris.

The testing has resulted in a considerable improvement in the illuminating power of the gas supplied in Cairo by the Gas Company.

## NILE GAUGES IN THE SOUDAN.

Captain Lyons gives a list of the gauges erected within the last two

or three years, on the Upper Nile.

A certain amount has been done in recording the river levels, but much more remains to be done and, of the duties of the future irrigation service in the Soudan, few will be more important than the erection of satisfactory Nile gauges; their safe-guarding, and daily record.

As Captain Lyons remarks—"Many of these ganges have been moved from time to time" and thus, unfortunately, in some cases,

n long record has been lost.

Many of those erected are purely temporary, and even the inclined teak gauges, though better than the others, are not entirely satisfactory. All gauges require constant looking after, and the one, of all that I have inspected in the Soudan, which was in the best order, was the gauge erected in front of the American Mission, at Doleib Hilla, on the Sobat; thanks to the care bestowed upon it by the members of the Mission.

Bench-marks are indispensable at every gauge site—otherwise, if the gauge is moved or broken, as has so frequently happened in the past, there is no means of connecting the readings of the new gauge with those of the old one and a valuable record is thus rendered valueless.

## GENERAL SCIENTIFIC OBSERVATION.

A certain amount of scientific observation has been carried out in 1903 on a small scale, such as the equipment of a few meteorological stations, the discussion of meteorological data which has been accumulated, the chemical examination of soils and water, and special lines of research at the Observatory. All the above subjects have however been taken up by the ordinary staff of the Department, in the spare moments of their work, but the limit of this time has been reached. Until some financial provision for scientific research can be made, further progress in this direction is impossible.

With an annual allotment of a few thousand pounds, added to Captain Lyons's budget, a great deal could be done, and not only Egypt

but the world would be the gainer.

I may mention one very important work, for which, in my opinion, a special credit is argently required—I mean a system of precise levelling, commencing in Egypt and carried up the Nile Valley into the Soudan.

In a country like Egypt, so entirely dependent upon irrigation and consequently upon a knowledge of the levels of the river and of the country, it is indeed strange that no precise levels of the Nile and of its valley exist. I allude to this, as being one of the most crying wants, but it is only one of many scientific operations which would, if funds were forthcoming, be carried out in Egypt. Captain Lyons has a very highly trained staff, but they are all over-worked and, without special funds, can do but little. With an extra annual credit, say of L.E.5000, to be devoted purely to work of scientific research, good progress could be made, and there can be no doubt that the result that would be obtained would be well worth this small expenditure.

## THE STAFF OF THE SURVEY DEPARTMENT.

Captain Lyons, in his report, mentions many of the members of this staff. I wish to add my testimony to his as to the very excellent services that these gentlemen have rendered. If do not mention any of them by name, it is only because I find it impossible to select any one of them for special mention. One and all of them have done well, and Captain Lyons has every reason to be content with the results of this year's work.

## III.—THE TECHNICAL SERVICE.

The expenditure for 1903, excluding the Government Arsenal, was as follows:-

follows:—							
						190	3
						L.E.	M.
Permanent Stell						5584	828
Temporary Staff				• • • •	***	2918	721
General charges	***	•••				642	973
Materials and plant			•••			1095	201
Repairs and maintenance of Govern	***	star	111107			4848	SDS
Repairs and mannenance of Govern	11114.112	-17.1	21112.4		•••		
	Total	1			LE.	15090	531
This is loss than the arranditure	Free	10	19	127	ъ.	13730	
This is less than the expenditure					al e Alais	1471 677.	
The details of the last item are a	is fo	llow	rs:-	_			
						L.E.	51.
4° 4 ° lièus barren						L.E. 2180	
Cost of working steamers	• • •			9 * *		2180	491
Repairs and maintenance				•••		2180 2235	491 359
Repairs and maintenance	• • •			•••		2180	491

This sum does not represent the real cost of the up-keep of these steamers, but merely that which appears in the Ordinary Budget. Thus, in 1903, the actual expenditure incurred was L.E. 6374, the difference being met from the Arsenal receipts, and the hire of the steamers themselves.

The items of Permanent and Temporary Staff, etc., require no special explanation. They are practically the same as in previous years.

#### THE GOVERNMENT ARSENAL.

The value of work executed by the Arsenal, in 1903, amounted to L.E. 21327, as against L.E. 28357 in 1902.

The following is a distribution of the charges:-

				1903 L.E.
Work done for Public Works Department			 	17021
other Government Services			 	5052
Cost of conl. oil, etc.			 * - *	247
Cost of cont, oil, etc		***	 • • • •	20051
Total	***		 L.E.	21327

The value of the work executed at the Arsenal in 1903, was less by L.E. 7030 than in the year 1902. This is due, to a certain extent, to a reduction in the work carried out at this establishment for private individuals.

Private work is now discouraged as far as possible, as the Arsenal is not intended to compete with the different trading establishments in Egypt, or elsewhere. Its primary object is to carry out work to meet the requirements of the Government Services. It will, in future, as far as possible, be reserved for the execution of this work alone.

The amount of work executed for private individuals in 1903 was L.E. 241.

The Government steamers were all overhanded and repaired before the flood of 1903. Some of these boats are hardly worth repairing, and it would probably be cheaper to sell them for what they would fetch and apply the proceeds towards the purchase of new boats, with more economically designed engines.

Stores and coal to the value of L.E. 11323 were issued from the Arsenal in 1903. Anis Pasha gives full details of the work turned out by this establishment. His report is a testimony to the excellent work done by the Director of the Arsenal, Mr. H. Curtis.

#### INSPECTION OF STEAM ENGINES.

The work in 1903 was satisfactory. The inspections were made without any of the old difficulties on the part of the engine proprietors, whether European or native. The licenses are now regularly demanded, and are made out without any nunecessary delay.

367 applications for licenses were received in 1903 as against 290 in 1902.

362 engines were licensed last year. Of these 233 were examined and their boilers tested.

In all, 1903 industrial engines are now working, duly licensed, in Egypt.

The "Contraventions" were few in number: 49 in all. 41 of these were before the native courts and 8 in the Mixed courts. 11 engines were stopped from working by the Native Tribunal and 6 by the Mixed Tribunals.

Three boiler explosions occurred during the year.

## QUARRIES.

43 new licences were issued in 1903 and 73 old licences were cancelled. The total number of licenced quarries in Egypt are at present 583. Of these 464 are for ten years and 119 in perpetuity. These last are the old forms of licence and such permits are never now

granted.

Anis Pasha has administered his Service in his usual able manner. His name stands so high that any words of praise from me must be more or less superfluous. I have already mentioned the good work done by Mr. Curtis in the Arsenal, and in the other branch of the Technical Service, viz., the control and regulation of steam engines, Mr. Crawley has rendered valuable assistance.

# IV .- THE MUSEUM AND ANTIQUITIES DEPARTMENT.

The expenditure for 1903, under the regular budget, was as follows:-

Permanent Staff Temporary Staff General Expenses	 	 				1.E. 7403 3594 3417	272 213
		Tota	ıl	• • •	L.E.	14411	829

Each of these items shows an increased expenditure over that of the previous year, the total excess amounting to L.E. 1227.315 Mill.

To the foregoing is added :-

			To	al	 L.E.	6833	988
Sale of publications			 		 * * *	574	072
Sale of shakis			 		 	543	
Sale of objects		8 * 6	 		 0 0 1	1050	
Entries to the Museum.			 		 	714	090
Receipts from Tourist fu	nd		 	***	 - • •	3951	
						L.E.	

It is satisfactory to note that all the above receipts show an increase over the figures for 1902. The total increase amounts to L.E. 864.076 Mill.

This expenditure is controlled by a permanent Committee, of which the Director General of the Antiquities Service is the President.

As in 1902, a sum of L.E. 4000 was granted by the Caisse de la Dette, for the compilation of the Museum Catalogue and for the repairs to the Karnak Temples.

The expenditure on the latter work was L.E. 2000 in 1903, the

balance being devoted to the preduction of the Catalogue.

Monsisur Maspero's report upon the working of his Service is of extreme interest and will well repay perusal. It contains a record of a good work on the part of himself and his staff. I regret that want of time prevents my doing more than making a very brief allusion to the chief points discussed.

#### THE ALEXANDRIA MUSEUM.

The Service sufferred a loss in 1903, by the death of Monsieur Botti, the curator of the Museum in Alexandria. By the end of the year his successor had not been selected.

## THE CAIRO MUSEUM.

The installation of the collection was continued and improved upon in 1903. The lighting in the upper story was altered and much improved, by the introduction of screens and wooden slades to the skylights. The painting of the interior was commenced by Mousieur Maspero's own staff, from funds provided by the Public Works Department. This work will be continued by degrees. A new room has been opened for the collection of the zoology and flora of aucient Egypt. The monument to Mariette Pasha was completed and his statue was placed upon it early in 1904.

### THE WORK OF THE SERVICE IN GENERAL.

The electric lighting of the tombs of the kings at Thebes functioned well throughout the season and without accident. The removal of the earth at the Ramseum and at Medinet Abou was proceeded with.

The tomb of Thormes IV was discovered, but had unfortunately been rifled.

Considerable repairs were executed at the temple of Edfu by Mr. Barsunti. This temple was in a most dangerons state, and consolidation was an argent necessity. L.E. 1596 was expended in 1903. The west wall was pulled down and rebuilt.

At Karinik, Mr. Legrain re-creeted the eleven columns of the great hall which collapsed in 1899, to a height of 6 metres above the floor. The earth in the centre of this temple has been cleared away and the masonry consolidated.

At Phile, Mr. Maspero says that the work done by the Public Works Department, in 1901 and 1902 (in the way of underpinning and consolidating the foundations) was so good, that in 1902, the total sum spent upon repairs to these temples was only L.E. 10.

At Sakkara, the work, round the pyramid of Onnas, commenced in 1899, was completed.

A great deal of work was done by private Sociétés and individuals in 1903. Monsieur Maspero gives a full and very interesting account of the year's record.

Unfortunately, Monsieur Goubert, of the Institut Français d'Archéologie, was killed at Tounali, by a fall from the rocks.

The receipts of the Service, ontside of the Budget, show an increase in 1903.

The following are the details:-

NATURES OF RECEIPTS	1901-1	902	1902-1	903	Increase.	
	L.E.	М.	L.E.	M.	L.K.	М.
Tourist fund	3796 926 625	500 610 550	3951 1050 714	100 885 090	154 121 88	600 275 540
(pottery)	621	252	1117	913	496	1160
Totals L.E.	5969	912	6833	988	864	076

## THE MUSEUM CATALOGUE.

Four new volumes were published in 1903. Six more are in the press.

## THE EXHIBITION AT ST. LOUIS.

A collection of objects, including life-sized models depicting scenes of ancient Egyptians' life, has been despatched to America for exhibition.

#### V.—AGRICULTURAL RAILWAYS.

The working of the Agricultural Railways was, on the whole, satisfactory in 1903. These lines tend to assist the development of waste lands; they give the Fellahin better markets for their produce, and they generally not as feeders to the trunk lines.

It must be admitted that they do, in certain local instances, compete more or less with the Government Railways, but in such cases the landowner benefits, as he is a gainer by the competition. The Government Light Railways Commission is at present studying the whole question of readjustment of the classification of goods and rates upon these agricultural lines.

#### 1.—THE EGYPTIAN DELTA LIGHT RAILWAY COMPANY.

The receipts of this Company, to the end of September 1903, show an increase of L.E. 3861 over the previous year. This result is a fairly good one, if it is considered that all markets were closed on account of the cattle plague and that the transport of stone to the Zifta barrage had ceased. This last item alone in 1902, brought in a sum of L.E. 14426.

The working expenses in 1903 increased by 4°/, over that of 1902. The following is a table of receipts and expenditure

	190)2	14();}
	14. K.	L.E.
Receipts	125610	129471
Working expenses	77193	\$0420
Nett receipts	48417	49051
Proportion of working expense to gross receipts	61. 1656	62.18%
	3,311,448	3,636,688
Good- carried—tons	463,928	471,529

The above cannot be considered as other than satisfactory returns.

The total length of the Company's lines is now 813 kilometres, of which 12 were constructed in 1903.

37 kilometres more are under construction.

With regard to rolling stock, the Company is still very short both as regards engines and waggous.

## H.—Chemins de fer de la Basse-Egypte.

The following is the statement of receipts and expenditure: -

	1902	1903
	L.E.	L.E.
Receipts	21857	23092
Working expenses	11150	11381
Nett receipts	10707	11711
Proportion of working expenses to gross receipts	51%	47.6%
Passengers carried	617,443	668,341
Good carried—tons	54,642	55,000

## III.—THE FAYUM LIGHT RAILWAYS.

The following are the returns for 1903 as compared with the year previous:—

	1902	1903
	L.H.	La E.
Receipts	12130	18423
Working expenses	11225	13251
Nett receipts	904	5173
Proportion of working expenses to gross receipts	92.5%	72%
Passengers carried	439,993	478,853
Goods truffic—tons	116,797	75,550

These figures are very fairly satisfactory. The result is largely due to the energy of Mr. Rangabé Bey, the General Manager.

The increase in the working expenses is due to the appointment of a better paid staff.

No extension of lines was made in 1903. The total length is 168 kilometres.

The Government Inspectors reports that the general administration of this Company still shows evidence of slackness.

Mr. Gnun's report upon the working of these lines in 1902 is full of details and will repay study by all interested in the question of light railway progress. These lines now compare very favourably with those existing in many parts of Europe.

## VI.—THE ZOOLOGICAL GARDENS, CAIRO.

Under the very able management of Captain Flower, these gardens have prospered well and made great progress during the year just passed.

The following is a summary of the receipts:-

					L.E.	Ma
Balance credit from 1902	 	 		 	191	386
Consumment counts		 		 	3144	
Gate receipts	 	 		 	1217	41(1
Miscellaneous etc	 	 0 4 0		 	61	201
						087
		Tom	1	 Li.	E.4614	(191

This is less than the total of the receipts for 1902, by L.E.452.446. On the other hand, the expenditure in 1903 was less than that for the year previous, being L.E.4504.526, against L.E.4875.147.

Consequently the balance to credit at the end of last year was

L.E.109,561.

Considerable improvements were made in the way of housing the collection and several new specimens were added.

On the 6th of October 1903, there were 959 animals and birds in

the garden, comprising 222 different species.

Captain Flower, in addition to superintending the Zoological Gardens takes charge of the collection of Nile fish in the aquarium at the

Ghezireh grotto.

Twenty-five varieties of fish, belonging to nine different families, are now to be found in the tanks. The collection is well arranged, and worth a visit. Unfortunately, it does not seem to attract the ordinary visitor, beautiful though the gardens, in which the aquarina is located, are.

The expenditure upon the tanks and fish in 1903 was only

L.E.74.191.

#### VII.—THE CENTRAL OFFICE.

The following is a detail of the expenditure
--

The following is a detail of the ex	chengin	HC.			
				L.E.	M.
Permanent staff			 	24944	468
Temporary staff			 	1968	082
General charges			 	3183	758
Material and furniture			 ***	114	80.5
New works (1)			 	17889	728
	Total		 LE	.18100	811
//\ m · · · · · · 1 1 1					
(1) This item is thus made up:	_				**
				L.E.	M.
Opera house subvention and staff			 	6746	960
Maintenance of above			 	1276	_
Zoological Gardens			 	1500	
Arab monuments	***		 	555	998
Aswan new lock			 - • •	1796	750
Inauguration Aswan Reservoir			 	5448	020
Sundry charges			 	120	_
•	400 . 0				
	Total		 Land	0.17889	728
1 1 1 1 1 1 1 1		M			

or more than that of 1902, by L.E.7287.639.

This increase is chiefly due to the expenditure upon the inauguration of the Aswan Reservoir, and that upon the new lock at Aswan.

#### THE STAFF IN 1903.

Monsieur Boinet Bey, the Secretary General, has given me the most efficient assistance throughout the year. His services have been of the greatest value.

As regards the services rendered by Mr. Farid Bey Babazogli, the Chef du Service Administratif, I have nothing to add to the remarks I have made in previous reports. They have been quite exceptional.

The entire staff has worked well.

### W. E. GARSTIN,

Under Secretary of State for Public Works.

Cairo, the 25th June, 1904.

# ADMINISTRATION REPORT

OF THE

# IRRIGATION DEPARTMENT IN UPPER EGYPT

For 1903

BY

A. L. WEBB,

INSPECTOR GENERAL OF IRRIGATION UPPER ECUPT.



# ADMINISTRATION REPORT OF THE IRRIGATION DEPARTMENT IN UPPER EGYPT FOR 1903.

## Part I.—IRRIGATION AND DRAINAGE.

## SECTION I.—THE NILE.

In previous annual reports it has been customary to describe the state of the river during the various seasons by comparing the levels of the year with those of the preceding one, or of some special year of high or low levels. In past years the Aswan gange has been taken as the basis of these comparisons, but owing to the completion of the Aswan Dam, and the filling of the Reservoir during the last months of 1902 and the three first months of 1903, and the utilization of its stored water in April. May and June of 1903, it can no longer be so accepted, for it is considerably affected by the operations of working the sluices of the Dam. Firstly, while filling is being carried out, the gauge which is situated near the Aswan town at a distance of five kilometres downstream of the Dam, records lower readings than it would if no dam existed, as a portion of the discharge of the river is daily retained in the reservoir: secondly, when the reservoir is full, and it becomes necessary to supplement the summer supply of the river for Middle and Lower Egypt, a portion of the stored water is daily discharged, and higher gauge readings consequently result.

Except, therefore, for the flood months of July, August, September and October, during which the sluices of the Dam are fully opened, and the supply passes freely, the Aswan gauge must be rejected as a

basis of comparison with former years.

It is, consequently, necessary to select for the winter and summer months a gange, which is unaffected by the working of the Aswan Dam, and Halfa, being a reliable masonry gange, can be chosen. In order to preserve a comparison with the past, the readings of the Halfa gange will be taken for the last year of the old system (1902), before the Dam was first brought into use in 1903.

Halfa Gauge. (Winter and Summer supply).—The following statement gives the reading of the Halfa gauge on the 1st and 15th of each month of 1902 and 1903, as well as those of November and December 1901, omitting the flood months of July, Angust, September and October for the reasons given above. Vide Plate I.

	Novemb.	Decemb,	January.	February	March	April	May	June
YEAR	l=t läth	1st loth	lat 15th	let lälli	Let löth	lat löth	1st 15th	lst läth
1901	1-33 3-75	3-23 2-09						
1902			2-70 2-20	1.01 1.73	1-60 1-39	1-25 1-30	1 - 22 1 - 23	1-13 1-30
1902	1.(3) 3.03	3.3. 3.10		11.195	2 . 4211 0 . 3 . 0	2 - abril 2 - 141		0.98 1.65
1903	3·43 1·65	3.80 3 40		2.20   51		1.55 1.10	1.00 [.00)	

From the above it will be seen that the levels during the winter 1902-1903 were higher than those of 1901-1902, but during April. May and first half of June, they were even worse in 1903 than the exceptionally low levels of 1902 for the corresponding months, and the supply for the summer crops would have been very poor, but for the extra amount given by the Aswan Reservoir. The early rise in June was, moreover, of great assistance.

The minimum levels registered at Halfa were:-

In 1902 1:13 from 30th May to 2nd June.

In 1903 0.95 on 21st May.

The levels in November and December 1903, as shown above, are somewhat higher than those of 1902 for the same months, and consequently, the prospects for 1904 are better than for the year under review.

Aswan Gauge. (Flood Months). Vide Plate II.—At the beginning of July the Reservoir was empty and the river passing freely through the shices of the Dam; on the 7th July the level was almost that of the average of 20 years (1873-1892). During July the rise was fairly normal, but the levels attained were below the average: during the first week of August the rise was slow, and at the end of that week there was a break till the 12th, which rendered the rise late and slow: after that date the rise was fairly rapid and continuous till the maximum of 16 pies 6 kirats (R.L. 92-93) was

reached on 27th August; from 25th to 28th August the levels were just above the mean of 20 years, but from 29th August they fell again, and remained so till the end of the year, except for a few days in October, and first half of November, when an unexpected rise occurred for 2 or 3 days.

For 41 days, i.e. from August 23rd to October 2nd, a level of 15 pies, and above, was maintained: this satisfactory level made the flood of 1903 a fairly average one, and similar to those of 1897, 1900 and 1901, as is shown by the following table:—

	1897	1900	1901	1903
Aswan Gauge Readings	p.k.	ր.հ.	p.k.	p.k.
Maximum Mean of 40 days August 16th to September 24th	16.0 15.6	16·5 15·7	16·1 15·3	16·6 15·5

Summing up the observations at Halfa and Aswan, the following results are obtained regarding the state of the river during 1903, viz:

- (a) During the winter months the levels were low.
- (b) During the summer months the levels were extremely low.
- (c) The early rise in June was very beneficial.
- (d) The flood was late in its early stages, but afterwards improved. and finally resulted in becoming an average one.

At Asynt.—The following statement shows the average of the daily gauge readings at the head of the Ibrahimyiah Canal during the summer months of 1903 and in typical years.

HEAD OF IBRAHIMIYAH CANAL.

TRAIL	AVERAGE	GAUGE-READE	NGS AT ASYUT	DURING	Nature of
-	April.	May.	June.	July.	Summer Levels.
1899 1885 1901 1889 1892 1900 1902	46.50 45.52 45.03 44.99 45.24 44.89 46.24	45.91 45.13 45.15 44.75 41.77 44.88 46.26	45.47 41.87 45.42 41.57 41.58 45.17 46.15	46.52 47.25 46.69 45.60 45.55 46.19 46.46	Itigh. Fuir. Low. Very Low. Regulation first made on the Asynt Barrage. Aswnn Reservoir first used for giving supplementary supply.

Owing to the regulation on the Asynt Barrage and the supplementury supply in the river from the Aswan Reservoir for the first time, the levels at the head of the Ibrahimiyah Canal were the highest on record, notwithstanding the very low state of the river at Halfa during the summer months.

The real rise of the flood reached Asynt on 25th July, and steadily but slowly continued until the 3rd August, when there was a break for a few days; on the 7th it again commenced to rise till the 11th August, when another break occurred; from the 15th August the rise was rapid, and continuous, until the 28th when a gauge of 51.64 was attained; from the 29th August the gauge fluctuated until the 16th September, when the maximum of 51.67 was reached; after that date the levels were well maintained until the end of the flood.

At Schag.—In last year's report the level of the Solag gauge was introduced for the purposes of comparison with previous years: as this gauge is now affected by the supplementary supply from the Aswan Reservoir, it should be omitted in future.

Gauges at the first Cataract.—The following statement gives the highest and lowest levels recorded above and below the first Cataract for the past seven years:—

		00 A 80		Miniman	GAVGE R	EADINGA.	MAXIMUM GAUGE READINGS.			
YEAR.				l'hibr.	Aswan,	Difference.	Philie.	.hewan.	Difference.	
1897				 90°56	R. L. 85 · 62	Metres 4:94	97 - 95	92.80	5.15	
1898	***			 89.74	84.74	5.00	99.05	93-63	5.42	
1899	* = 0	•••		 90.70	85.15	5.92	97-181	91:67	5:33	
1900		* * *	***	 11:20	84.07	7.13	98.51	92.91	5.63	
14011				 \$1(115)()	84-54	6:36	(19) - 07	115.25	6.25	
1100				 111 - 10	81.43	6.67	97.70	91 - 72	5.98	
1903			***	 92.90	84 - 35	8 - 55	98.94	92.75	6-14	

The Philae gauge is on the Philae island one kilometre upstream of the Dam: the Aswan gauge is on Elephantine island, opposite Aswan town, six kilometres downstream of the Dam. Between the Dam and the Aswan gauge there is a considerable fall over the rapids in the different channels of the river, so that the above figures do not give the actual head on the Dam and are somewhat misleading.

Comparing the different years, it would seem that the actual afflux due to the Dam is about 50 centimetres, which is very satisfactory:

owing to regulation on the sluices of the western channel to assist navigation a comparison with former years is, however, not reliable.

River gauge South of Halfa.—These are now recorded by the Director General of Surveys, who has a complete register of all gauges.

#### SECTION H .- SUMMER IRRIGATION.

The volumes entering and utilized in the Ibrahimiyah Canal during the summer months of the last five years, and the very low years of 1889 and 1892, are given below in cubic metres per second, together with the dates of the complete closure of Deirnt Escape:—

	Am	t11.	31/	۱۲.	Ju:	NE.	Date of complete closure
YEAR.	Discharge at head.	Discharge utilized.	Discharge at head.	Discharge utilized.	Discharge at head.	Discharge utilized.	of the Deirut Escape.
1889 1892 1899 1900 1901 1902	37·1 48·4 145·1 46·9 48·4 82·8	37·1 48·4 96·5 46·9 48·4 54·6	32·5 36·1 123·5 141·9 146·6 55·5 101·5	32·5 36·1 118·4 +41·9 (41·8 55·5 64·7	26 · 4 29 · 5 83 · 0 49 · 4 64 · 6 64 · 6 106 · 7	26·4 29·5 83·0 {46·1 64·6 64·1 66·2	15th February, 9th March, 1st June. 14th February, 1ttle-opened 10th May. (Rechosed 10th June, 18th February, 16th to 19th January 18th to 19th January 18th to 19th January 18th Lot 10 24th Feb. 6th Feb. 10 24th Feb. 6th Mar. 10 25th Mar. 27th June to 3th July (15th July to 19th tet. 6th February.

N.B.—In 1909 and 1902 regulation was unde at Deirut for the benefit of Lower Egypt, as the discharge entering the head of the Brahimyiah Canal was in excess of the proportionate share for Middle Egypt.

The discharge utilized varies with the discharge available, and after the complete closure of the Deirut escape, the whole of the available discharge is utilized.

From the above it will be seen that the supply available, and utilized, was excellent in April and May, and in June far greater than obtained in any previous year, in spite of the low state of the river at Halfa: the increased supply is due to the benefit derived from the Aswan Reservoir. The result was to ease the rotations in the old perennial area, to give sefi water to the converted Asym basins, and half the Minia basins, and also to the whole of the Fayum Province, which had only been partially supplied in previous years.

Supplementary supply from the Aswan Reservoir.-In 1900 and 1902 regulation was made at Deirnt for the benefit of Lower Egypt, and part of the Ibrahimivah discharge was escaped there, as the supply at the head of the canal was in excess of the proportionate share of the

river for Middle Egypt.

In 1901 there was no regulation at Deirnt, and the discharges of that year were taken as a basis for the requirements for Middle Egypt. The discharges of 1901 for April, May, June and the first half of July, gave a mean of 6 millions, and this supply was insufficient. To this was added & million to make good the deficiency, another million for ensement of rotations on the old perennial area, and 2 more millions for extra sefi area expected in the converted basins and the Fayum, the whole making a total of 91 millions.

The additional supply to be received from the Aswan Reservoir to give this 9% millions was thus arranged:—

Required at Second 1st April to 15th May... 3 millions To be let go seven Asyut Second 1st July to 14th July... 5 " days earlier of Aswon

The netual discharge at the head of the Ibrahimivah Canal, which was utilized, gave 91 millions during April, May and June: during the first half of July it was in excess of that amount, as it was found possible to let the reservoir be discharged earlier than anticipated, owing to the early rise at Halfa; to obtain a discharge of 94 millions a level of 46.50 to 46.55 is required at the head of the Ibrahimiyah.

Owing to the low levels of the river, it was found necessary to supplement the river discharge by 1 million a day from 10th to 21th March for the Ibrahimiyah supply; this, however, should have been nvoided, as water was still leaking through the Delta Barrages.

Fayour supply.—Up to the end of 1902 applications for sakielis to replace shadcofs, and engines and pumps to replace groups of sakichs. had been generally refused throughout the 4th Circle, but with the advent of the Aswan Reservoir they were granted during 1903. There were numerous applications for the areas on the sahels of the Yusufi from Deirnt to Lahan, and with the object of giving an increased supply for this extension of seft area and for the expected increase in the Faymu, regulation on the Yusufi head was made as follows:—

During first half of April 30 cents higher than levels of 1902. During second half of April 20 cents higher than levels of 1902. During first half of May 20 cents higher than levels of 1902. During second half of May 10 cents higher than levels of 1902.

The old area of the Faynm Province was taken as 330,000 feddans, and it was assumed that one third or 100,000 feddans, requiring 3 millions per day, would be put under sefi crops: the area reported is, however, only 69,000 feddans, being an increase of 22,000 feddans over

the area of the previous year.

During April, and first half of May, the mean discharge of the two canals (Ynsufi and Hassan Wassif) entering the Fayonin was 3,700,000 cubic metres per day, of which a considerable proportion was used for the irrigation of the berseem crop, which was late. From the second half of May to July, the discharge in the two canals gave just under 3,000,000 enbic metres per day, which is sufficient for the anticipated area of 100,000 feddans; the whole supply, however, seems to have been utilized somewhere, as the levels of Lake Qaram were not affected, as would have been the case had water been running to waste. The only conclusion that can be arrived at is, that the return of the sefi area as 69,000 is incorrect.

Rotations, -Rotations commenced on the Ibrahimiyah Canal and branches between 15th and 20th April. There were two classes of rotations on the main regulators of the Ibrahimiyah, viz:—

Minia Regulator Matai Regulator Magaga Regulator Above Sharahnah Below Sharahnah	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 000	Chass I.  7 days 6 days 6 days 10 days 12 days	Chass II, 8 days 7 days 11 days 13 days
On the Saheliyah Canad Above Raramun Below			CLASS I. U days 10 days	CLASS II. 10 days 11 days

The more severe third class of previous years was rendered unnecessary by the supplementary supply from the Aswan Reservoir. During the summer of 1903 rotations were introduced on the canals of the Asyut converted basins. At first three groups were tried, but this was not satisfactory, and subsequently two groups or sections on each of the main canals worked successfully; they were as follows:—

On Deirutiyah Canal.—The first Section was everything north of the Dermuwas Regulator including the Ashmmin Canal and its branches. The second Section was from the head of the Deirutiyah to Dermuwas Regulator, with Ganabiyah's East and West of that regulator.

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On Badraman Canal.—The first Section was Badraman Canal below Beni Haram regulator, and all its branches in this length, Arus Canal and branches, and Nasriyah Canal north of Regulator in Tanuf Saliba with branches. The second Section was Badraman Canal from head to Beni Haram Regulator and branches (except Arus Canal).

Melwaniyah Canal and Nasriyah Canal from head to Tanuf Salibah bridges, with Ganabiyahs east and west at those bridges.

The classes of Rotations were:-

					CLASS L	Chase II.
On	Deirutiyah	Canal	1st Section	*** ***	10 days	10 days
99	91	0.9	2111	**1 ***	8	10
On	Badrannen	Canal			8	[1]
21	0.0	9.9	2nd		10	10 ,,

In the Fayum Province rotations were worked on the heads of the two main canals at Lahum, the Yusufi and Hassan Wassef, during June in alternate periods of 10 days each; this system seems to have been more satisfactory than the old one, and is certainly far more simple.

In the northern Minia converted basins where seft water was given for the first time, rotations were introduced from 21st April till 21st July. The canals were divided into three sections, each section taking water 6 days out of 18. The rotations worked successfully, but as the system of canals will not be complete until the Southern Minia basins are converted, it is too early to give any definite opinion on their final success.

The Cotton Crop.—The areas under cotton irrigated by the Ibrahimiyah Canal and its branches in the past six years are as follows:—

1	3.	(1)	1				0	0	• •			• •	0		* *				9.00	10	0,005	feddans
-4	O		. "	0 0		0 0		0	- 0											. (1)	11,887	
- 1	o"	LPI	1.7	0.0			0	8	0.0		0									. 9	5,845	**
à.	of	1.1	J.	9.0		0 -	0	0		0 0	1	0.0		0		 0	0	0.0		. 10	5,750	**
1	13	M A	-			* 1		۰										- +		. 11	5.356	**
I	0	e I,	0 8	9.0	0	0 0				0 0	0			0						. 15	3.HIKE	

showing an increase of nearly 60,000 feddans over the previous year, and nearly 50,000 feddans over the previous record year of 1901.

The following statement, kindly furnished by Mr. Wakehan, Agent of Messrs. Carver Bros in Upper Egypt, shows the out turn of the ginning factories in the different provinces during the past six seasons.

Shason.	Asyut.	Minin.	Benl Soef.	Fayum.	Toral.	Average price per kantar.
	kantary.	kantars.	kunture.	kantnes.	Lantars.	P. T.
1898-1899 1899-1900 1900-1901 1901-1002 1902-1903 1903-1904	Nil. Nil. Nil. Nil. Nil.	74,000 105,000 104,000 128,000 161,650 ,000	143,000 139,000 131,000 174,000 164,500 235,000	137,000 170,000 130,000 130,000 145,000 235,000	354,000 444,000 365,000 432,000 471,150 765,000	156 205 275 205 275 275 325

The out turn of 1903-1904 shows an increase of 62 per cent over that of the previous year, whereas the increase in area under cotton enlitivation is 60 per cent. It is generally allowed that the crop of 1903 was not as good as that of 1902; it may, therefore, be presumed that the areas under cultivation are incorrectly given, and should be greater in 1903 than shown above.

The following statement gives the area of feddans of cotton in the different provinces, irrigated by the Ibrahimyiah Canal and its branches, including the Bahr Yusef, during the past six years.

YEAR.	Asynt,	Minia.	Beni Suef.	Faynm.	Total
1898	2,635	19,580	26,253	57,537	100,005
1899	1,874	20,576	22,277	46,160	90,887
1900	2,753	27,912	26,086	36,094	92,842
1901	3,361	26,599	28,177	17,613	105,750
1902	1,824	26,085	27,103	40,344	95,356
1903	8,349	54,527	31,872	58,254	153,002

There is a large increase in each Province; Minia is greatest with 28,000, Fayumnext with 18,000, Asynt 6,500 and Beni Suef last with 4,800 feddans.

Besides the above areas there were 501 feddans irrigated from the Nile direct, and from wells in the Minia Province, and 6,297 feddans, in Beni Suef Province in the basins from wells and Nile direct. The increase in Minia and Asynt is due to the conversion of some of the basins, and to the decrease in the area of Qedi grown in the basins, as well as to the decreased area of sugar cane; in the Faynin, the increase is due to the better supply given in the summer months.

Sugar cane.—The following statement gives the quantities of cane crushed in the chief factories in Upper Egypt and the out turn of No. 1 Sugar during the past six seasons:—

	Dam	а 543пен		Dama Sc	utan Pai	FF 4.	DES STUR	CENKRIO EDIE DE LEGITE	E.A.	Enterior St can and Lard Company		
SEASON.	Canding Cand	Daremann		Chne	Outturn No. 1 Sugar	Percenture	Cane crushed	Sa. I Sump	Permitage	Cane clumped and Section of Secti		therementage
	Kantars	Kantars		Kantars	Kantars		Kantara	Kantare		Kantary	Kantary	
1810-1819,	15,680,911	1,252,823	0-3	170,822	43,585	9-1	4,050,300	004,(nc)	9.4	310,205	15,334	9.9
1899-1910.	14,515,565	1,569,953	Drit	466,021	12,039	9-3	5,97K,471	575,000	516	544,730	16,50H	912
1908-1901.	11,850,643	1,181,471	D-214	321,164	an, and	91116	H.1628,772	682,557	37°35 h	450,500	41.5In	Smithi
1401-1982.	12,412,482	1,213,913	loul	410,460	10,720	0.13	7,000,548	012,811	10 (22)	-	-	
1402-1902.	11,145,191	1,008,100	9 2	5-65,931	48,902	N-SH	8,004,757	700,884	2-0	-	_	_
1901-1906.	-	_	-	\$41,524	27,071	0.81	1 c,450, c e e	1,200,452	2.21	-	-	-

The total number of kantars crushed and the total outturn of No. I Sugar for each of the six years included in the statement are as follows:—

HIASON.	Cane crushed.	Outturn of No. 1 Sugar.
1898-1899	21,969,136 20,134,223 20,506,465 19,719,209	1,950,750 2,080,637 1,975,337 1,928,886 1,870,582 1,486,386

The following statement gives the area under sugar cane irrigated from the Ibrahimiyah Canal in the different provinces, during the last six years, and the area grown South of Asyut irrigated by pumps and wells:—

YEAH,	Asyut.	Minin.	Beni-Suef.	Faymo	Total,	South of Asyut.	Grand Total.
1898 1899 1900 1901 1902 1903	9,883 9,473 8,052 12,780 10,519 8,646	35,232 33,829 22,139 28,413 28,904 25,430	5,383 7,082 5,670 6,282 5,725 4,072	854 677 458 618 700 669	51,352 51,061 36,319 48,093 45,947 38,817	17,410 11,522 15,091 14,853	53,759 62,615 61,038 53,670

The figures of 1903 in Middle Egypt are less than those of 1902, owing to the substitution of cotton cultivation for that of sugarcane.

Sorghum or Summer Durah.—The following statement gives the areas of summer durah or "Qedi" grown in the basins of the different provinces during the last six years:—

	Au	EAS IN F.	EDDANS I	S THE DI	FFUNEST	PROVINCE	29.	
YPAR,	Aswan.	Kenn.	Glegn.	Asyut South.	Asyut North.	Minio.	Beni- Suef.	Total Area.
1899 1900 1901 1902 1903	3,195 2,972 2,482 3,381 3,221	23,334 24,258 21,526 19,510 18,863	29,984 39,261 41,433 38,372 40,034	10,150 12,389 10,334 12,555 10,341	8,572 7,701 7,850 9,232 810	5.495 3,890 4,734 5,072 905	7,072 6,076 8,734 5,384 4,239	87,766 96,547 97,093 93,506 78,413

<sup>\*</sup> This does not include the six northern basins of Minia, which were under conversion, and no accurate record kept; next year this item will disappear altogether from the returns.

Maize and Winter Crops.— The area of Nabari durah sown in the southern provinces is estimated at 134,000 feddans against 165,000 feddans in the previous years. The decrease is due to the better levels in 1903; in low floods the areas sown in the higher portions of the basins are considerably more than in years of good or average flood.

Duty of Water.—The total area of summer crops irrigated by the Ibrahimiyah Canal, according to figures furnished by the Chief Engineers, is shown in the following statement:—

Province.	Cotton.	Sugar Cam.	Sell Dumb.	Other Crops	Total,
Asyu1	8,349	8,646	7,263	_	21,258
Minia	54,527	25,430	11,701	1,197	92,855
Beni Suef	31.872	4,072	2.283	2.169	40,396
Fuyum	58,254	169	-	10,055	68,978
Totals	453,002	35,817	21.217	13,421	226,487

In the above figures for Minia are included 2647 feddans irrigated from the Bahr Yusuf, which must be deducted when dealing with the Ibrahimiyah canal discharges; thus, the Minia area should be taken as 90,208 feddans, and similarly in Beni Suef an area of 10,485 feddans was irrigated from the Bahr Yusuf, therefore the Ibrahimiyah area in Beni Suef will be 29,911 feddans.

The mean and minimum discharges recorded during the year in the Ibrahimyiah and Yusufi Canals are as follows:—

('ANA),	Siln	April to June	Lowest resorded discharge c.netresper day.
1. Ibrahimiyah	Above Deirnt Below Deirnt Maglangha	8.625,929 5,332,978 1,036,429	7.128,000 4,001,184 793,152
4. Bahr Yusuf & Hassan Wassif	Lahun	3,289,124	2,354,400 3,208,032

N.B. The discharges for No. 5 are obtained by deducting No. 3 from No. 2.

Taking the areas in the different Provinces we obtain the duty of water in each group as follows, in cubic metres per day per feddan irrigated.

Province	Total area of Crops.	Duty on mean discharge,	Duty on intuinmin recorded discharge,
<ol> <li>Asyat, Minia, Beni Suef &amp; Fayum</li> <li>Minia &amp; Beni Suef together irrigated from Ibrahimiyah only</li> <li>Beni Suef irrigated from Ibrahimiyah only</li> <li>Fayum</li> <li>Minia irrigated from Ibrahimiyah only</li> </ol>	120 · 119 29 · 911 68 · 978	38 · 08 44 · 39 34 · 65 47 · 68 35 · 23	31:40 33:31 26:51 34:13 23:16

These duties are remarkably low, and can only be accounted for by the excellent supply enjoyed by Middle Egypt owing to the Aswan Reservoir and the Asynt Barrage. The mean and minimum discharges have no doubt been abnormally increased by the rapid discharge of the Reservoir in June, at the same time the duties show that the supply was more than sufficient; it should, however, be remembered that owing to a late season the berseem crop, which is not included in the sefi area, had to be irrigated up till the middle of May, and at the end of June the surplus water was used for irrigating Sharaki lands for the flood durali crop.

#### SECTION III.—FLOOD IRRIGATION.

General Character of Flood.—As already described, the flood was late in its early stages, but afterwards developed into one of average levels, and no real difficulties were experienced in carrying out the flood irrigation.

Filling the basins.—In the Aswan isolated basins water commenced to enter the canals on 14th August, and the basins reached their maximum levels between 27th and 29th August; all the water was utilized for the irrigation of the durah crop, so that none was discharged on to the river. The Sharaki area is about 1,000 feddans.

In the Ramadi system water entered the basins between 10th and 17th August, and T.R. levels were reached between 19th September and 7th October.

The level of the river at the head of the main canal was 0.81 metre below the T.R. level of the southern basin El-Ramadi, but only about 130 feddans were left sharaki.

A rotation was established between the basins and the Matana Teftish to give water to the sugar cane: it seems to have given satisfaction.

In the Asfini system, water entered the basins between 14th and 18th August, and T.R. levels were reached between 14th September and 14th October.

A rotation was also made in this system between the basins and the Daira Sanieh Teftish.

In the Fadiliyah system, water entered the basins between 15th and 18th August, and T.R. levels were reached between 30th September and 18th October.

In the Sahil Farshut system, water entered the basins between the 16th and 18th August, and T.R. levels were reached between 18th September and 10th October.

In the Kilabiyah system, water was admitted to the basins between 10th and 15th August, and T.R. levels were reached between 4th and 8th October.

In the Bayadia system, water entered the basins between 14th and 16th August, and T.R. levels were reached between 30th September and 12th October.

In the Shanhuriyah system, water was admitted to the basins between 11th and 17th August, and T.R. levels were reached between 27th September and 25th October.

In the Ghilazi system, water entered the basins between 15th and 18th August, and T.R. levels were reached between 21st September and 19th October: this system was fed through the Kena Khor for the first time.

In the Girga Directorate the main canals were opened between 10th and 15th August, but, owing to the low levels at the commencement of the flood, water did not enter the basins of the following systems until the dates shewn, viz:—

Khiyam System	between			15th	and	17th	August
Akhmin South Sohag	91	* * *		12th	0.0	16th	99
North	V 4			12th 13th	0.9	23rd 24th	99
Khizindariyah	0.0		•••	13th	910	22ml	0.0
•				201(1)	0.0		TT

Wherever possible, the tail escapes of the different systems were opened so that water might enter into the basins direct from the

river: in no case, however, did this last more than a few days: no water was taken from the Samhud basin to feed the southern basins of south Sohag system, nor was any drawn from Hod Hamad for the Khiyam system.

Owing to the long period at which the Aswan gauge stood above 15 pics no difficulty was experienced in bringing all basins to their T.R.

levels early in October.

In the Asynt Barrage Directorate water was allowed to flow freely from the Sohagiyah through the Gebel Asynt Regulator, which it reached on 14th August. Regulation was made on Gebel Asynt Bridge from September 20th to bring the southern basins to T.R. levels.

The basins in the Asyut-Delgawi system were filled without difficulty from the Gebel Asynt Regulator, assisted by the Muharak and Qusiyah feeders from the Ibrahimiyah Canal, which were open from 23rd August to 26th September, and by the Delgawi feeder head which was opened whenever the 4th Circle could spare water.

The level maintained in the Yusufi downstream of the Deirut Head was R.L. 46,40, which proved perfectly satisfactory for the sahils on

the west of the Yusufi as far as Badraman.

On the east of the Ibrahimiyah Canal from Asynt to Deirut all basins were easily filled with the exception of the Waladiyah basin, which was only brought to a sufficient level to prevent Sharaki by the flush in the

river, due to the discharge of the Abutig escape.

In the Abnub system, water entered the basins between 12th and 17th August, and the whole system was filled by 12th September, with the exception of Hods Goraib, Wasta, and Maasara which were brought to T.R. levels from the Maghar El-Matmar Canal between 13th and 15th October.

In the 4th Circle Mr. Clowes describes the filling of the basius as follows:—

"The Bahr Yusuf was maintained at a level of 46,40 below Deirnt from 23rd August to 2nd October, when it was lowered to allow of

takfif from Hod Delgawi.

"Hod Tima and its hoshah and Hod Beni Khaled in the Asynt Province, were late in receiving water, due to the tardiness of the cultivators in removing their durah crop. These Hods received their supply from the Yusufi, and were filled easily, Hod Beni Khaled being kept low purposely till the end of September to pass part of the Yusufi supply through the Hod.

"The flooding of the west of Yusufi basius, Minia Province, began from 12th August for the Northern system, and 15th August for the Southern system.

"Upstream Nezlet El Abid Regulator reached T.R. level of 40.50 on 24th August, and up to this date a downstream level of 38,50 had been kept for requirements northwards. During the last week of August the downstream gauge at Nezlet El Abid fluctuated, but throughout September a mean level of 38,90 was unintained, which is about 30 cents higher than in 1902, owing to a higher level of about

30 cents being run at Deirnt in the Yusufi.

" Saqulah upstream level rose steadily, and reached its T.R. level of 31.50 on 1st October, an average level of 31.30 being maintained downstream for the benefit of the Lahun gange till the middle of September: in the second half of September the level fell to a mean of 31.00. The Southern system of the West of the Yusufi Minia basins began takfifing at the end of September, which caused the downstream level at Saquila to rise, and also gave the upstream level required, which could not be obtained at an earlier date, as a greater head than 3 metres is not permitted on this Regulator.

" Due to the takfifing of West Yusufi basins, Minia Province, it was found possible to regulate on Mazurah on 30th September, and T. R. level was obtained above that Regulator on 3rd October. The downstream level was kept at a mean of 28.30 through August and September, and up to 11th October, which was sufficiently low to let

the Mazurah drain work efficiently.

" In the Beni Suef Province, the Nile level on 12th August was sufficiently high at Sharahnah to feed Hod Sultani, and the old Mazurah Head in the South West corner of Hod Sultani also passed in a small quantity of water on 19th August. From 28th August Hod Sultani maintained a gradual rise to the end of September, and was then brought up rapidly from the Yusufi by regulation on Mazurah.

" All the basins to the north of Sultani filled well: Hod Koshesslanh was low all through September, and first half of October, but had a good watering in the second half of October; Hod Riqqah had a high level all through September and October.

" In Asyut, Hod Timah and its Hosha were brought to T.R. level by 8th October from Hod Delgawi, feeding through Hatatbah Bridge. Hod Beni Khaled was left low till 28th September, and was brought up to T.R. level by 6th October, on which date it was let go, so as to allow part of the Yusufi surf wave from Delgawi escape to pass

through it by means of its new big 5 arch escape. After 9th October it was up again to T.R. level on 12th October: to prevent the Hod fulling when it has once reached T.R. level, it would be best to open the Beni Khaled escape simultaneously with the Delgawi escape.

"The West of Yusufi Minia basins were brought up to T.R. levels during the last week of September, except Hods Tukh and Bortobat, the southern Hods respectively of each system, which were brought

to T.R. levels in October by the sarf wave in the Yusufi.

"In Beni Suef Province, by regulation at Mazurali on 29th September Hod Sultani was brought up to T, R, level on 12th October and was kept full till the end of October to give the Southern end a good flooding in the last year before conversion to Sefi. The surplus water of the Hod, obtained from the Sultani Nili feeder, which was also working efficiently, and was not closed down till 19th October, was passed on to the northern basins, Nina Nuerali, and Bahabshin, which were all up to T.R. levels by 20th October, and kept so until 29th October. Hod Kosheshah began to feel the Yusufi Sarf wave on 16th October, and from this date rose rapidly to its T.R. level of 26:75 on 24th October and was maintained at that level for 5 days.

" Hod Riqqah was brought to T. R. level on 20th October."

Discharge of the Basins.—(5th Circle).—The following statement gives the dates of the commencement and completion of the Sarf operations in the different systems:—

NAME OF SYSTEM.	.5	arf operations (	ounne	need-	L Sarf operations comp			
		Between:-			_	3etweet		
Ramadi,	Sth	October and	Hilli	October	25th (	October	and 7th	November
Asfun	8th	11	14th	••	25th	*9	Oth	9.9
Fadiliyah	8th		19th	0.0	21st		111-1	October
Sahil Furshut	Sth	**	17th	40	20th	• 1	1111	November
Killabiyalı	-4tls	0.0	Sth	19	24th	44	26th	October
Bayyadiyalı		40	21st	• •	2150	77	5th	November
Shanluriyah		••	26th	9.0	24th		Sth	**
Ghilasi		* 9	24th	44	28th	0.0	7th	70

Girga Directorate.—The following statement gives the dates of the commencement and completion of the sarf operations in the different systems:—

NAME OF SYSTEM.	Sarf operations commenced.	Sarf operations completed
Khiyam Akhmim Khizindariyah South Solag North .,	Between:—  3rd October and 11th October  3rd	Between:— 27th October and 30th October 19th 30th 19th 30th 21st 7th Nov. 16th 30th October

Asynt Barrage Directorate.—The following statement gives the dates of the commencement and completion of the sarf operations in the different systems:—

NAME OF SYSTEM.	Sarf operations commenced.	Sarf operations completed.
Asynt Delgawi	9th October.	24th October.
Asynt Deirnt E	8th	25th
Abumb	9th	20th

4th Circle.—The sarf operations along the Yusufi canal from Deirut to Kosheshah are very interesting owing to the absence of the artificial wave, which was formerly created by cutting the tarrads of the eastern Minia basins, now converted to perennial irrigation. Mr. Clowes writes as follows:—

"Delgawi basin was let go on the morning of 9th October, but owing to the usual amount of water not being in the Yusufi, because of the non-flooding of the sahels between Deirut and Masraf Delgawi, the necessary level of 45.20 in the Yusufi below Delgawi escape was not reached outil 10th October, and this was only obtained by sending a flush of 30 cent. down from Deirut for 24 hours, the levels there being raised from 45.30 to 45.60, Hod Tunah was let go on 9th October.

The surf wave passed down the Yusufi and the crest of it reached the main regulators on the following dates:—

Nazlet-el-Abid		***	 1 * 0	 ***	13th	Ìο	16th	October
Saqula	***	- * *	 * * -	 ***	17th			
Mazurah					19th		22ml	49
TWITTING			 1 * *	 	24th	100	27th	94

"Nazlet-el-Abid Lock and Regulator were fully opened on the afternoon of 12th October. The sahels along Hods Tukh and Qamadir were flooded by means of Hoshahs, to fill which and not to delay the sarf, numerous cuts were made, namely three in Tukh Tarrad on 11th October, and five in Tarrad Qamadir on 13th and 14th October. For the sahels north of Salibah Shushah, it was found necessary to cut tarrads Shushah and Tirfa on 16th October; the escape of Hod Tirfa on to the Yushfi was opened on 15th October, and El-Der Escape fully opened by 18th October.

The Saquia Lock and Regulator were fully opened on the afternoon of 16th October; Tarrad Hariqah was cut on 17th October for flushing the Yusufi sahels, and the Shenara and Delhanis escapes were opened on the same date.

No Sharaki on the Yusufi was left throughout the Asyut and Minia provinces.

Mazurah Lock and Regulator where fully opened on the afternoon of 18th October, and, as a level of 31.20 was obtained downstream on 19th October, no sharaki was left on the Yusufi in the Beni-Suef province.

Hod Kosheshah began to feel the sarf wave of the Yusufi from 16th October, and from this date rose rapidly, and, because of the high levels in the river, it was found necessary to check this rapid rise of

the basin by partially opening the Kosheshah escape.

No sarf wave was required in the Nile for Lower Egypt, and the increase of river levels was limited to a flush of 30 cents giving a river gauge of 25.80 below Kosheshah escape: thus in order to get rid of the surplus water coming down the Yusufi, it was necessary to takhfif on the Kosheshah escape before the basin reached its T.R. level. On 22nd October eight of the lower gates were raised, and on 23rd ten gates were open, and on 24th and 25th fifteen gates. As the Nile rose at the escape, and the difference of the up and downstream levels was not more than one metre, it was found possible to regulate with the lower gates and the basins was kept at T.R. level from 24th to 29th October. The flush in the river from 22nd to 25rd October being only 21 cents and the river levels commencing to fall away rapidly, the basin was easily discharged from the 24th October.

"When it was found that Hod Kosheshah was full, and the supply for Gizah through Komi could be maintained, the four Hods Sultani, Nim, Nucra and Bahabshin commenced their sarf on to Hod Kosheshah from 29th October, by which date the wave in the Yusufi had diminished, as indicated by the Lahun gange, where the fall commenced from 28th October. Hod Riqqah was brought to T.R. level on 20th October and from 22nd October Komi bridge was opened to supply Gizah, the downstream levels being:—

 22nd October
 24.10
 25th to 28th October
 24.80
 4th November
 24.20

 23rd
 "
 24.55
 29th "
 30th "
 24.60
 5th to 9th Nov.
 24.50

 24th
 "
 24.60
 31st Oct. to 3rd Nov.
 24.30
 9th to 12th Nov.
 23.50"

The Hod Riqqah was sarfed in the usual way.

Regulation between Circles.—Between the 5th Circle and Girga directorate no regulation was necessary.

Between the Girga directorate and the Asynt barrage directorate regulation was made on the Gebel Asynt in the usual way.

Between the 4th Circle and 3rd Circle all former rules for regulation were cancelled and the following substituted, viz:—

4th Circle.—From the commencement of the flood the El-Komi bridge was completely closed.

3rd Circle.—From the commencement of the flood the supply for the Gizeh basins was taken from the Gizah canal, which was kept fully open.

3rd and 4th Circles.—As soon as Hods Kosheshah and Riqqah were full, the Komi bridge was opened to complete the Gizeh basins according to the demands of the 3rd Circle.

Mr. Clowes points out how necessary it is that the Hoshahs in the Gizeh province should be always ready by 10th to 15th October, so as to allow Komi Regulator to be opened as soon as the Yasufi water can be spared from the Kosheshah basin, instead of opening the Kosheshah escape on to the river, where the levels are necessarily limited. I entirely agree with him, and would fix 15th October as the latest date for opening the Komi Regulator, i.e. that the Gizeh hoshahs and basins should be ready to take water on that date, if any is required, and the 4th Circle is prepared to give it.

Regulation at Deirut and in Yusufi.—Mr. Clowes, Inspector 4th Circle, has submitted the important and excellent diagram, Plate III, showing the flood regulation in the Yusufi from Deirut to Lahun during 1903, and the following useful information.

To obtain necessary flood levels at Deirut namely 46.75 in the Deirutiyah, 46.40 in the Yusufi, and 45.20 in the Ibrahimiyah below

Deirut regulator, it is necessary to have a level of 50.90 to 51 above the Asynt barrage.

In 1903 a level of 46.40 was first obtained in the Yusufi on 24th August, when the level above the Asynt barrage reached 50.96 on the 23rd August.

It is not possible to run a higher level in the Yusufi than 46.40 or perhaps 46.50 without flooding the sahels ketween Deirut and Badraman, and from the diagram it will be seen that there is very little water to spare north of Maznrah beyond the Fayum requirements, if Gizeh basins, when converted, are to be fed from Lahun. The amount available is that which now enters Hod Kosheshah, which will not be required when Kosheshah is converted to seti, as it will receive its supply from the Ibrahimiyah at Sharahuah. Furthermore when the west of Yusufi basins in Beni Suef are constructed, a higher level above Mazurah will be required during September, but this can be obtained by not letting Nezlet-El-Abid apstream reach its T.R. level of 40.50 till 15th to 20th September instead of from 25th August as in 1903.

A supplementary supply can also be given to the Yusufi through Hod Delgawi, although a higher level than 46.40 cannot be run in the head reach of the Yusufi between Deirnt and Delgawi escape.

When the Ibrahimiyah canal is commanding all the converted basins of Minia and Beni Suef provinces, through the Sabakah and Sultani canals respectively, it will be necessary to have flood rotations, and this will also be advisable to reduce the amount of drainage water.

Regulation during flood for drainage.—During the past few years arrangements have been made to discharge the drainage in the Minia province in flood direct on to the Bahr Yusuf, as long as the levels of the latter would permit; during the passage of the sarf wave, however, the levels of the Yusufi are higher than those in the Main Muhit drain, and, consequently, the outlets must be closed with the result that water accumulates in the drains, and great pressure is felt, especially in the Feshu discrict, where it is difficult to keep the drainage water from swamping the crops. In spite of all instructions, it is impossible to prevent the cultivators from allowing the surplus water of their irrigating channels to escape into the drains: it was decided, therefore, to adopt special measures of regulation.

Mr. Clowes thus describes what was done.

To relieve the Minia province drainage north of the Etsa Pumping station while the Yusufi sarf was in progress, the Ibrahimiyah canal was lowered downstream of Deirnt on the 11th October from 45.30 to 44.70 and kept at that level until 25th October. All branch canals on left bank of the Ibrahimiyah were closed north of Minia to Sharahnah during those 15 days, and no complaints were received for water in this area for irrigation. The reduction of the drainage was completely successful and fortunately the drains were comparatively empty when the breach occurred in the Muhit bank on 16th-17th October, north of Abn Rahib, the discharge from which would have swamped out the Feshu district.

The Abn Rahib drainage escape was closed on 7th October as the Yusufi levels rose above these of the drain on 8th October; the Mazurah drain was closed on 17th and 18th October reopened on 19th October, reclosed on 20th, and again opened from 21st October, and remained so to the end of the year; from 17th October to 5th November, however, the discharge from it could have been but little as the levels in the Yusufi during that period were above 39.90 downstream of the Mazurah regulator.

Further relief was given to the drainage of Feshu by cutting the sadd in the Absug Brain at Sharahnah on 3rd November, and letting that branch drain discharge out into the Nile. With a system of rotations during flood on all canals in Asyut and Minia of the old perennial area, and of the converted basins, it will be possible to keep the Mazurah drain low, and probably working continuously except during the period of the passage of the Yusufi sarf, when it will be advisable to close down all the canals for a period of a week or 10 days. This very important regulation will be repeated next year, and if found successful, it will be possible to do away with pumping stations in this reach altogether.

Sharaki expenditure.—In making Hoshuhs and other special works for preventing sharaki the following expenditure was incurred:—

Sharaki areas.—The only areas left unirrigated were in the isolated basins of the Aswan district, and on high islands and sahels in the

river, the total of which should not exceed 5000 feddams; parts of this will probably be irrigated by lift during the winter.

Accidents and breaches during flood.—The breaches which occurred were:—

- (1) Left bank of the Ibrahimiyah canal at Beni Mazar on the night of 25th August, due to the negligence of the cultivators in not protecting a private outlet. Water was pumped out of the birkets in the village by a staff and pump sent down by the Asyut barrage directorate: practically no damage was done.
- (2) Breach in Tarrad Hod Qayat opposite Ezbeh Nagagi Pasha on 23rd September, which was quickly closed.
- (3) Breach in Yusufi East Tarrad (on Muhit bank) north of Abu Rahib escape, due to negligence of watchmen. It was soon closed and as the Muhit drain had little water in it at the time, because of the closure of branch canals of the Ibrahimiyah north of Etsa for 15 days, no damage occurred to the low lands at Feshu: this was mainly due to the satisfactory working of the Mazurah drain.

Accidents.— At the end of the year, it was found that a large piece of the extension of the downstream floor of the Deirut escape had been completely broken up; the necessary repairs and the division of the lock into two bays, estimated to cost L.E. 6500, will be carried out in 1904.

#### SECTION IV.-FLOOD WATCHMEN.

Nile Corvée.—The total number of men called out was 17,651: the average number of days they remained out was 56; the total number of days labour was 992,132. The following statement gives the distribution of the men in the different circles. In the Projects Circle the men were called out for the protection of the banks of the new canals, in connection with the conversion works of the Minin basins.

-	1.4.	Atmary maniper	왕양풍류	-5	3	F	t= 25	東京	0 0 0 0 14 0	1 15	是
	Torus	Fumber of men	25 S S S S S S S S S S S S S S S S S S S	410	1681	475	13121	E	1220	25.0	13551
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H OF	NILE	selming parties.	[원류용	1	1	==	1	1872	-	255	1
THREE		Cumber of men.	122	1627	1	存著	20 ES	171	1-	## (F)	3176
Z		CHETAGI AND PROVINCES.	Fryum Berl Suff Minla Argut North	Total	Winla	Kenn Awan	Tolul	Aryut South	Tellin	ASYLT BARRADE DRIECTORATE,	Grand Total

#### SECTION V.-DRAINAGE.

All new draininge channels made during the year will be described under the head of special works.

In the clearance of drains 267,330 m.c. were executed at a cost of L.E. 3,413.

The Etsa Pumping Station was worked during the flood of 1903 for the first time; as the station was still under the Project Circle its working will be described under the head of "Special Works".

Levels of Lake Qarun.—The following table gives the levels of Lake Qarun on the 1st of March for the past 20 years.

YEAR.	Level of lake in metres below sea-level.	Fall la previous 12 months.	LEAR	Level of lake in metros below port-level.	Fall or rise to previous 12 months.
1885	39:89	Unknown.	1895	44.17	0:33
1886	40.00	0,20	1896	44.16	0.11 rise.
1887	40:38	0.38	1897	41:27	0°11 fall.
1888	40.73	0:35	1898	44:32	(r05
1889	41.17	0744	1899	11:25	0r07 rise.
1890	42.00	0.83	1900	44.10	0.15 "
1891	42.78	0.78	1901	43:90	0.50
1892	43:32	():54	1902	44-19	0.29 fall.
1893	43.78	0.46	1903	44.43	0.24
1894	43.84	0.00	1901	44.72	()-2()

There would seem to be little danger of an appreciable rise in the level of the Lake, notwithstanding the increased supplies entering at Lahun.

#### Part II.—RESERVOIR WORKS.

#### SECTION I.—EXPENDITURE.

The total grants made for the Reservoir Works are as follows:-

Original allotment		• •••	est. 2,000,000 or 1,342,263	1,950,000 1,908,706
Te	otal		£-t.3,342,263 or	L.E.3,258,706
The total expenditure v			**************************************	
To Messrs. Aird & Co. Certificate			3,320,272 or	3,237,265
Cost of materials taken vernmeni			6,053	5,002
170	otal		£st.3,32,6325 or	L.E.3,243,167

leaving a balance of L.E.15,539 which was used for payments of land, etc., expropriated.

The total expenditure of L.E.3,243,167 may be approximatively divided as follows:—

Aswan Reservoir Dam and Locks Asynt Barrage and Ibrahimiyah Canal	Head		2,370,081 873,086
	Total	 • • •	L.E.3,243,167

Although a complete delivery of the works to the Government was made on 10th December 1902, the final payment to the contractors could not be made, according to the specification, until two months after the completion of the works.

A final payment was made to Messrs, John Aird & Co. by certificate No. 55 on 4th April 1903, amounting to £st.3,320,272 or L.E.3,237,265.

The following statement shows the yearly and total expenditure in pounds sterling on the Reservoir Works during the years 1898-1903, according to the payments made to the Contractors.

# STATEMENT SHOWING THE EXPENDITURE ON RESERVOIR WORKS TO END OF 1903.

			Hxpe	mditu	re in		
	1898	1899	1900	1901	1902	1903	TOTAL
	£	K.	C	K	A.	#	£
Permanent work, Aswan Dani	20,885	273,075	567,016	840,921	298,560	1,514	2,001,971
Retention under clause 39 of Specification	3,132	20,261	6/11	-	-	33,000	_
Payment on account of Perma- nent work	17,753	243,811	566,412	840.921	254,340	34,514	2.001,971
Aswan Data	20,729	72,716	71.020	138,202	26,212	_	_
Advanced on Plant	31,010	83,545	8,915	56,844 187,916	18,826	_	_
Advanced on Materials	25,376	112,813	Lefallabat	1 (114.0711)	0.679.071.717		
and Rapier	-	55,972	69,133	100,699	96,748	16,491	345,037
Total payment on account of					201010	F9 441*	2,317,005
Aswin Dam	91,898	248,895	713,344	611,562	274,312	141 TH P.1	2,011,000
Advanced on account of Asynt welr and Lock	16,021	274,917	240,765	232,740	75,900	500	rip,ati
Advanced on account of payment for land	23.100	12.100	1,548)	560	_	_	10,500
Advanced on account of Import	8,100	15,1500	13,000	9,00m	1,249	_	47,751
Subsidiary works	3,931	8,731	1.315	1,526	1,5493	(500	15,467
Total est.	176,367	883,535	1,0 H 10 9, 100 P.S	K58,328	350,982	50,767	3,320,272

From the commencement of the preliminary studies the total expenditure on the Reservoir Works, exclusive of permanent establishment is as follows:—

	San Ess	840.400
Expenditure as shown above	3,243,167	
Preliminary surveys, and preparation of projects 1891 to 1897 inclusive	18,673	
Temporary establishment, permanent buildings, maintenance &c., 1898-1903	84,319	
		3,346,159

The two last items were found from the orninary budget.

In addition to the above the Finance Department contributed on account of the Reservoir Works, for land and property expropriations and compensation, a sum of L.E. 124,346 so that the total expenditure from the commencement to the completion becomes L.E. 3,470,505.

Since the commencement of 1903 the Asynt barrage works have come under the newly formed Asynt Barrage Directorate, and from the commencement of 1904 the Asynn Reservoir Directorate has also been created, and separate allotments in the ordinary budget, under Chaps, IX, 8.4 & IX, 10.4 respectively, have been granted. At the end of December 1903 the extraordinary expenditure on Reservoir Works ceased, and in future the expenditure will be shown under ordinary budget.

# Section II.—THE ASWAN RESERVOIR. (Filling and Discharging the Reservoir).

Filling.—For the season 1902-1903 the filling of the reservoir was commenced on 20th October 1902 and continued till the end of Jannary 1903, when the full level of R.L. 106-00 was reached. In last year's report the reasons for this early filling are given, and it is also stated that "it is certainly not advisable to repeat this programme except under similar conditions" on account of the silt deposit which might result. As far as can be ascertained the silt deposit has been very little, at all events not sufficient to appreciably diminish the contents of the reservoir: whatever silt is deposited, seems to a great extent to have been scoured away in the following flood.

Fortunately it has not been found necessary, owing to the better supply in the river, to commence filling for the season 1903-1904 till the 1st December, and to complete it by the 12th March.

From 1st February to 10th March 1903, the reservoir was kept full, and the river supply passed through the upper shrices.

Discharging.—On the 15th March 1903 it was decided, owing to the low levels in the river, to commence the discharge in order to supplement the supply of the Ibrahimiyah canal and to maintain the levels required for Lower Egypt.

On the 1st May the demands for Lower Egypt commenced and rapidly increased towards the end of the month.

The following quantities were discharged from the reservoir and added to the river supply.

	March					1	million	cube	metre-	IHIT	day
**	00	26th	40	May	Ist	2	0.3	9.0	919	90	77
0.9	May	lst	7.0	9.0	20th	-1	**		94		
	**							11	*3	77	**
27	June	Sril	0.0	70	2.1111	30					

At the end of June the rise from the south commenced to reach the reservoir and maintained the levels in the river which had been artificially produced by the discharge of the reservoir water. The discharge of the river itself in June was about 20 million enbic metres per day, so that the reservoir discharge practically doubled the available supply at the most critical time for the irrigation of the summer crops.

The filling and discharging of the reservoir entails an immense amount of calculations and diagrams, constant watching of the river levels, and careful manipulation of the shuices of the Dam. Considering that this was the first year of the reservoir's existence, and that there was no previous experience of its working, Messrs. May and Macdonald and their staff deserve great credit for the successful regulation of the supply.

Results of the working of the reservoir.—The levels in the river south of Halfa were very low during the latter part of March, throughout April, and May, and the early part of June, in fact lower than the exceptionally bad levels of 1902, as shown on Diagram I: without help, therefore, from the reservoir the supply would have been quite inadequate for the irrigation of the summer crops, and great difficulty would have been experienced in saving the cotton crop.

The result of the discharge of the reservoir was to give an ample supply in Middle and Lower Egypt at least one month earlier than would have been the case without the reservoir: the rotations were everywhere relaxed early in July instead of the middle of August: the prohibition to irrigate the land for planting the dura crop was removed one month earlier than had ever been done in previous years; the irrigation of rice, which had been prohibited in previous years, was again allowed: and, finally, the whole cotton crop was plentifully irrigated.

In Middle Egypt 170,000 feddans of basin lands were converted to perennial irrigation, thus giving an increased numual rental of LE,500,000 and an increased value of the land of L.E, 5,000,000.

#### SECTION III.—THE ASYUT BARRAGE.

Regulation for purposes of navigation was commenced on the Asynt barrage on 20th March: afterwards it was continued for irrigation.

The greatest head on the Barrage was 1.30 m, on 2nd April, the up and downstream levels being R.L. 46.95 and R.L. 45.65 respectively: the Barrage was fully opened on 14th Angust.

The results of the regulation are shown in Part I. Section I of this report.

#### SECTION IV. -SUPPLEMENTARY WORKS.

New Sahel Lock.—In order to improve the navigation in the river between the Aswan dam and Aswan town, it was decided at the end of 1902 to construct a new lock at the Sahel rapid, where boats experienced great difficulty in passing. The work was put into adjudication and entrusted to Messrs. Williamson and Urquhart, who successfully completed the work in one season, so that the ironwork was all fixed to enable the lock to be worked in July 1903. The ironwork was supplied by Messrs. Ransomes and Rapier, and is of their usual excellent quality and workmanship.

The total cost of the Lock was L.E. 49,331, which was made up as follows:—

Ordinary Danger	• • •		***	L.E.	49,331
Ordinary Budget					47,532 1,799
Balance from Phila Temples		 	***	6,993	L.E.
Advance by Finance Department		 		15,539	
Caisse Grant		 		25,(10)()	
				1_31_	

The Lock has been quite successful, and when the lateral banks have been completed, navigation should be perfectly safe at all seasons.

Apron downstream of the Dam.—In order to protect the river bed immediately under the upper sluices of the Dam and prevent erosion at the toe of the wall, it was decided to put in a masonry apron. On the western side the work was completed before the flood at a cost of L.E. 5,474, which had been advanced by the Finance Department and is to be recovered from the Caisse Grant in 1904.

Philar Temple.—No expenditure was incurred during 1903. The Caisse Grant for the consolidation was L.E. 19000 and the expenditure L.E. 12,007 leaving a balance of L.E. 6,993 which was utilised on the New Sahel Lock.

### Part. III.—SPECIAL WORKS.

(Chargeable to Special Caisse Credit and Special Grant from Ordinary Budget).

The sum available for expenditure on special works during the year

was as follows :-

Special Caisse Grant		•••	***	423,436 15,138
To	otal	• • •		L.E. 438,574

The total expenditure was L.E. 438,456, leaving a balance of L.E. 118 to be carried forward, or, excluding the balance on the Ordinary Budget, which will lapse, L.E. 117 only.

In addition to the above the Finance Department made the following advances, which are to be recovered from the Special Caisse Grant of 1904, viz:—

## Conversion Minia basins .-

Works Land	•••	•••	 • • •	 • • •	4 * *	 	***	 * * *	38,133 64,756
						Tota	11		LE. 102,889

Of this amount L.E. 38,133 were spent on works and L.E. 22,578 on land, leaving a balance of L.E. 42,178 for land payments in 1904.

The total amount available for expenditure was, therefore, as follows:-

Special Grants from Caisse and Ordinary Budgets Advances by Finance Department to be recovered in 1904	438,574 102,889
Total [4	E.511,463
and the expenditure was as follows:—	121.
On Special Grants	438,574 55,806
Total 1.	E. 494,380

Leaving a balance of L.E. 47,083 to be carried forward to 1904, or, excluding the Ordinary Budget which will lapse, L.E. 47,082 only. This balance will be paid in 1904 for land, for which all formalities were not complete in 1903.

Appendix F. gives a general abstract showing the distribution of the expenditure on the various projects namely:—

4th Circle.—							
						1K.	I., 11.
West Hufiz Gannaldyah						65	Admining
Waladiyah Syphon		•••	***		* * *	(500)	
				* * *			
Programme 1 111						3,799	
1 symm remoderning projects		9 0 0		- • •		67,882	
							72,346
Parianta Clinit							
Projects Circle.—							
Asynt basin conversion						9 1700	
Somhern Minia basin conversio		* * *			* + *	3,100	
			***	* 0 0		60,002	
West Cinch		***		* + 4		154,079	
Enlarging Ibrahimiyah canal	* * *			110		4,740	
Ramodolling Model Dec						101,510	
Remodelling Muhit Drain						52.750	
Etsa Pumping Station						25,898	
Establishment. Temporary and	[ Con	tings	ncie			15,955	
							418,034
5th Circle.—							
Olli Tille.							
						4,1800	4,000
	Gra	nd to	ta1			T. 131	494,380
		1	*****	9 9 9		· 44.84.	Bottles HTG

The appendices G and H give the details of the expenditure on the various masonry works, new channels and banks constructed, and existing channels re-modelled during the year.

The following note gives the details of each project taken in hand, or advanced during the year:—

4th Circle.—West Hajiz Gannabieh.—The small sum spent was for land, the project having been completed in 1902.

Walidiyah Syphon.—The expenditure of L.E.600 was the balance due on work done in 1902. The pipes were re-smk, but the end lengths could not be attached, owing to heavy slips of the canal bank when excavating the pit, and the early rise of the flood stopped completion of the work. It has been decided to raise the pipes, and re-sink them in 1904, with parts of the end lengths already attached.

Asynt concerted basins.—A sum of L.E.3799 was spent on a few small branch canals and drains found necessary after the first year of working of the sefi canals in the newly converted basins, and in the construction of five small masonry culverts, and three road bridge regulators. Some iron pipes were also provided in drains where village roads crossed them. Two iron pipes were also fixed under the Muhit bank to drain two local depressions on the west of the Muhit in Hod Itqa into the Muhit drain.

This project has now been completed and handed over by the Project's Circle to the 4th Circle. The total expenditure in converting 58,085 feddans from basin to perennial irrigation, excluding the widening of the Ibrahimiyah Canal, Muhit drain and Etsa Pumping Station which will be spread over the whole area of Middle Egypt, is L.E.184,081 i.e., the cost of the actual conversion works in the basins becomes L.E.3.17 per feddan of converted area.

Fayum Remodelling Projects.—The total expenditure on new works in the Fayum during 1903 was L.E. 67,882 of which L.E.2,526 was for establishment and L.E.65,356 for works.

The projects taken up or advanced were :-

The expenditure was as follows:-

#### Canals.-

								115,		
	Land				1 0 0			1.652		
	Farthwork							35,374		
	Masoury works			0 - 0		4 9 7		13,650		
	Ironwork in bridges	and	pipes					1.312		
	Rubble revetment							803		
	Demarcation stones				- 0 0			411		
									52.831	
Drains.										
4 - 7 14177117,										
	E							L.E.		
	Earthwork					• • •		THEFT		
	Masoury works							4,420		
	fronwork, pipes, de						* * *	445		
	Klazzan Tamiyah							660		
									12,525	
					free					
					T	otal.		1.	E.65.356	

At Tamiyah there has been in past years a small lake covering an area of 200 to 300 feddans, held up by the old masonry walls across the deep khor. Owing to the high level of water in this lake all the Serb, Rodah, and Rubiyet lands were considerably affected and could not get efficient drainage. It was decided to run off the water in the lake, and in future to maintain such a level above the Tamiyah Khazzan that would allow all the drains of the affected lands to work properly. Two wrought iron pipes, each of 1.50 metres diameter, were placed through the old retaining wall of the lake, and necessary masonry falls were constructed below. The sadd above the work was cut in October, and the lake lowered to the required depth.

The whole operation was neatly and most creditably carried out and

the results have been quite satisfactory.

#### PROJECTS CIRCLE.

Conversion of Southern Minia Basins.—The conversion project for hod Tahmashawi, Quran, and Tahawi, forming the southern Minia basins, and comprising an area of 51,897 feddans, was carried out in 1902 and the canals were opened early in August of that year. During the flood the experience of the working of the canals showed what further works would be necessary to complete the system. These works were carried out in 1903 and consisted of clearances of canals, strengthening banks, excavating new clamnels, construction of head shrices, regulators, escapes etc.

Altogether the following were executed:-

Clearance of canals			195,151 M.c.		2572	
Strengthening banks			289,393		3907 8212	
Masonry work			72 No. 1372 km.		334	
Outlets pipes Revenuent Bahr Yusef	0 0 0	b = 0	5222 M.c.	**	1851	

The new canals and drains and their extensions aggregated a total of 37½ kilometres.

The total expenditure, including cost of land (L.E.37,029) incurred in 1903 was L.E.60,002. Adding this to the L.E.155,541 spent up to the end of the previous year, the expenditure to date becomes L.E.215,543. The estimated further expenditure for land, outlets, etc., is L.E.77,747, so that the total expenditure to complete the project becomes L.E.293,290, or L.E.5.65 per feddan converted.

Conversion of Northern Minia Basins.—The conversion project for Hods Deri, Mangatin, Membal, Bardanuhi, Garmssi, and Salaqusi forming the Northern Minia Basins and comprising an area of 55,433 feddans was carried out in 1903. The works were commenced in January, and water admitted to the canals on 10th August.

```
The total length of irrigation channels was ...
                                                           310 kilometers
                " drainage
                                                            230
                                       ** ***
                                                   ...
          number of masoury works
                                                            293 No.
                                       90 ...
         cube of earthwork
                                                  ... 5,749.981 M.c.
   99
                                       10 ...
 27
          cost of earthwork
                                                         99.815 L.E.
                                                  ...
                                       .. ...
           " .. masonry works
                                                         50,037 .,
                                       ** ***
```

The total expenditure amounted to L.E.154,079.

To complete the project, including the cost of land, it is estimated that a further expenditure of L.E.77,670 will be necessary, making a total of of L.E.231,750 for the conversion of 55,433 feddam or L.E.4,18 per feddam of converted area.

Conversion of Hods Kom Sauydah, Sultani, Nina and Nuera.—The conversion project for these basins has been drawn up and approved. It has been decided to carry out the conversion of Hods Kom Saaydah and Sultani in 1904. In order to irrigate the sahel of the Bahr Yusuf in Hod Kom Saaydah an extension was made from the tail of the Sabakhah Canal to feed the Belhasa Canal at a cost of L.E.1.171.

Conversion of West Giza, Hods Qoshesha, and Riqqah.—The project for the conversion of these basins was studied and submitted in 1903; it consisted of the conversion of the whole tract into Seti conditions. It has now been decided to modify the project, and to keep the western part, situated between the Lebeni channel and the desert under basin irrigation; the modified project is now being prepared. For the proposed Lahan Canal through Hod Qosheshah for supplying the Giza Province with sefi water (a part of the modified project) 21,380m.c. of rubble stone was collected at a cost of L.E.4,490. A sum of L.E.250 was also spent in printing the map of West Giza.

Widening Ibrahimyiah Canal.—In order to supply the converted basins of Minia, Beni Suef and Gizeh Provinces, it is necessary to widen the Ibrahimiyah Canal from Deirut to Ashmant, a length of 207 kilometres, and of which the following have been taken in hand, viz:—

- (a) Deirnt to Minin ... ... Length 66 kilometres
- (h) Minia to Matay... ... ... , 40 ...
- (c) Matay to Mayanah ... , 30 ,

With the exception of the first section, which is being executed by dredgers, all the rest of the canal is widened by hand labour during a closure of 30 days in December of each year.

Deirat to Minia.—In October 1902 a contract was made with the Behera Company for hand work and dredging at an all round rate of 32 milliems per cubic metre: the work is to be completed by 1st December 1905. Handwork was commenced in December 1902, and dredging in May 1903. Considerable progress has been made with the hand work, but, owing to unforeseen difficulties, the cube dredged has been unsatisfactory, and in order to assure the completion of the work and not delay the conversion works in the basins, it has been decided to execute the greater part of the length between the Hafiz and Minia regulators during the closure of the canal in December 1904 and 1905. The quantities executed to date are 839,295m.c. of hand work and 231 400m.c. dredging: the total expenditure to date is L.E.33,999.

Minia to Matay.—The work in this reach, part of which was carried out in the previous year, was completed during a month's closure from 15th December 1902 to 15th January 1903. The expenditure during the year was L.E.51,333.

Matay to Mayanah.—The drywork only was executed from January to July 1903: the expenditure was L.E.17,274.

The wetwork was commenced during the closure of the canni in December 1903 and completed in January 1904, but no payment appears against the Budget of 1903; about 10,000 men were employed. The work has been excellent, and most creditable to those concerned; where completely finished, this magnificent canal can vie with any existing.

Altogether the expenditure on widening the Ibrahimiyah Canal has been up to date L.E.165,035.

Remodelling West Muhit Drain.—The West Muhit Drain is the Main Drain for the newly converted basins of Asynt and Minia, as well as the old perennial area. It has been widened and remodelled from the Sabakhah Canal to Sharahma, a length of 123 kilometres, and is now a most excellent and efficient drain. From Sabakhah to Etsa the remodelling was done in 1902.

From Etsa to Sharahnah, a length of 86 kilometres, the work was done in 1903, and with the exception of some bed clearance, which will be completed in 1904, was satisfactory. The expenditure in 1903 was L.E.52,750; and altogether L.E.79,431 has been spent up to date.

Etsa Pumping Station.—In the drainage project of the tract situated between the Nile and the Bahr Yusef from Deirut to Etza, was included a pumping station at the river end of the Etsa Nili Canal, in order to pump the drainage water into the river during the flood, when the level of the river would not allow the drains to work freely.

In September 1901 a contract was signed with Messrs. Easton & Co. Erith, Kent, for the supply of the neessary plant, consisting of four vertical direct acting engines of 165 I.H.P. each, four Easton centrifugal pumps of 40 inches diameter each, six boilers with a working pressure of 125lb per square inch, and all accessories. In May 1902 a contract was made with Messrs. Zaffrani, Annigoni and Gandolfi for the construction of the necessary buildings, with the exception of the two chimneys which were entrusted to Mr. Alphons Custodie of Dusseldorf.

At the commencement of August 1903 the whole installation was completed, and un-official trials were started of each engine, which were found satisfactory.

The pumps were worked continuously for lifting drainage water into the river from 6th October to 15th November, each engine running an average of 700 hours.

On 11th December Mr. Crawley commenced the official trials which lasted three days: he has submitted an excellent report on the results of these trials. Although the actual levels specified in the contract could not be obtained, and the slide valves had ent so badly that engine No. 4 had to be stopped before the completion of the trials, yet there is no doubt that the pumps can deliver 2 c.m. per second with a hit of 4.5 metres and 115 revolutions of the engines, and a coal consumption of 1.85 lbs. per H.P. per hour according to the specification.

Mr. Crawley has pointed out certain defects in the machinery, the most serious of which is the cutting of the valves and cylinder faces which he attributes to the bad quality of the material supplied: a sum of L.E.1,000 has been retained to rectify the defects, as far as possible, but Mr. Crawley is of opinion that piston valves should have been specified, and it is more than probable that it will be cheaper in the long run to adopt them, though the first expense will be somewhat costly.

With the exception of this defect, the whole installation has been well arranged and credinally executed.

The expenditure during 1903 was L.E.25,898 and up to date L.E.42,937: a further sum of L.E.2,200 is required in 1904 for the construction of quarters, coal store, tools, etc., so that the final cost of the whole installation will be L.E.45,137.

Cost of Conversion Works.—Exclusive of the cost of the widening of the Ibramiyah canal, remodelling the main Muhit Drain, Etsa pumping station, petty works and temporary establishment, the cost of the actual conversion works in the basins themselves is as follows:—

Asyut Prov	ince.—								
**							1):.	36.	
Original	estimale					 4 4 1	9	005	per fe ldan.
Revised	**					 	2	034	77
Actual	9+	100	* * *			 	3	017	27
Minia Prov	ince.—								
							LE.	M.	
Original	estimate			0 0 1		 	3	1115	per feddan.
Revised	4.7		- • •						**
Final	9-9	0.0 0			* * *	 	4	089	**
Beni Suej and	d Gizeh	Prov	ince	.—					
								M.	
E-timate						 9.00	4	_	per fe ldan.

It will be seen from the above figures that the original estimates have been more than doubled, and L.E.4.000 to L.E.4.500 per feddan converted is the average price which it is estimated the whole of the actual conversion works from Deirut to the Delta Barrages will cost. The reasons for the increased cost are as follows:—

- (a) In the Asynt Basins the cost of land was L.E.30, whilst in the Minia, Beni Suef, and Gizeh Basins it will not be less than from L.E.45 to L.E.50 per feddan, owing to the great rise which has taken place in the value of basins lands since the commencement of the conversion works.
- (b) In the Asynt Basins the main canal of the system already existed, whereas in the Minia, Beni Suef, and Gizeh Basins, it has to be constructed.
- (c) Owing to the increased area of sefi cultivation, the cost of labour has very much risen throughout Middle Egypt: the Sugar and Cotton Factories have considerably felt this, as it is difficult to get ordinary labourers for less than 5 P.T. per day against 3 P.T. a few years ago. The increased cost of labour has naturally produced a corresponding increase in the cost of the works, which is shewn as follows:—

	Earthwork per cubic metre.	Masonry per cubic metre.	Land per feddan.
Asym Basins Minia Basins	1.E. 0.0125 0.0160	ын. 1.150 1.300	1.E. 30 45 to 50

In the Asynt basins the actual cost, per feddan converted, for the land expropriated was L.E.0.52: in the Southern Minia basins it becomes L.E.1.60, owing to the extra value of the land, and to the increased area required for the main canal.

Total Cost of Conversion Works.—As stated above the cost of the widening of the Ibrahimiyah Canal, remodelling the main Muhit Drain, and other works outside the basins themselves, has been omitted.

The following shows the total estimated cost of the Conversion Works in the Asyut, Minia, Beni Suef and Gizeli basius, comprising an area of 451,000 feddans and including all subsidiary works:—

	L.E.
Actual Conversion Works	 1,739,506
Widening and extension of Ibramiyah Canal	
Gizeli Canal from Lahun	
Drainage channels main Muhit and new main drain	 267,336
Pumping Stations	 150,000
Establishment and petty works for six years	 180,000
Total	 3,020,225
Contingencies	 179,775
to.	
Grand Total	 3,200,000

or L.E.7 per feddan converted from basin to perennial irrigation.

Result of the Conversion Works.—Up to the present 170,000 feddans have been converted from basin to perennial irrigation, and assuming the total final cost, as distributed over the whole final area of 451,000 feddans, to be L.E.7 per feddan, the expenditure will be L.E.1,190,000. The result has been to raise the rents at least L.E.3 per feddan and the value of the land at least L.E.30 per feddan in other words, by an expenditure of L.E.1,190,000 the increased annual rental is L.E,510,000 and the immediate increased value of the land L.E.5,100,000. Recent inspections show how very rapidly the cultivators, stimulated by the very high prices of agricultural produce now ruling in the market, have adapted themselves to the new conditions. In the first year very little sefi cultivation can be done, owing to the want of watercourses: in the second year more than half the area is under summer and flood crops: in the third year the whole area is under sefi conditions.

In the 5th Circle.—In making a new railway bank at Hod Hamad a sum of L.E.3,630 was spent and, in the Aswan District in minor works L.E.370, making a total of L.E.4,000.

#### Part IV.—WORKS AND ESTABLISHMENT.

#### SECTION I .- MAINTENANCE AND REPAIRS.

Details of the quantities of earthwork executed during the year and its cost, are given in Appendix D. The total quantities are as follows:—

Circle	Hy h	and	Dredging.	
VINOLE	Quantity, Post.		Quantity.	Cust.
	C.31.	L.E.	C.M.	LE.
4th Circle	3,865,990	48,045	_	~
5th Circle	2,883,966	36,072	-	-
Girga Directorate	2,069,749	23,062	ndo-100	_
Asyut Barrage Directorate	633,388	7,323	100,000	8,91-
Totals	9,458,093	114,502		

In the 4th Circle and Girga Directorate there is a considerable reduction, owing to the transfer of works to the newly formed Asynt Barrage Directorate.

The Ibrahimiyah Canal from the head to Deirut, together with its works and dredging, has been transferred from the 4th Circle to the Asynt Barrage Directorate. Under the new contract with Messrs. Duport & Jones a minimum cabe of 100,000 M³ is guaranteed: the rate for this is 60 milliemes per cabe metre for dredging and 10 milliemes for removal by hoppers making a total cost of L. E. 7,000. Making an allowance of L.E. 400 for lockage at the rate of 5 milliemes extra, the amount becomes L.E. 7,400 which has now been allotted under Corvee Abolition in the Asynt Barrage Directorate's Budget for 1904 and will be continued annually. If it is found that more dredging is required than the minimum cube of 100,000 M³, then the 4th Circle must find the funds to do the extra cube.

In 1903 a sum of L.E. 1,600 was spent in carrying the dredged material to fill up the old diversion channel of the canal which was used during the construction of the Head Regulator.

Altogether, then L.E. 7,400 ± 1,600 = L.E. 9,000 was transferred in 1903 from the 4th Circle to the Asynt Barrage Directorate.

Spurs in the Ibrahimiyah Canal.—There was no expenditure on spurs in the Ibrahimiyah Canal during the year.

River Protective Works.—The following statement shows the cubes of stone purchased and built into river spurs and revetment, during the year, and the expenditure incurred on transporting and building Government stone into the same:—

CIBCLE	New	מלוודה	Transport and	Total Cost.	
C I BC to Eo	Cube.	Cost.	old stone.		
	C.M.	1.2.	1	1_12.	
4th Circle	9,309	325	133	458	
5th Circle	2.312	370	12	382	
Girga Directorate	4,029	1,029	490	1,519	
Asynt Barr, Directorate	5,489	812	258	1.070	
Totals	14,222	2,536	893	3,129	

In the 4th Circle L.E. 142 of the above was impaid, and a further expenditure of L.E. 1,196 was incurred on 4439 M<sup>2</sup> of stone used in the protection of Badbit et Matalira, which was badly attached during the flood; these amounts will be paid in 1904. In the 5th Circle and Girga Directorate L.E. 407 and L.E. 220 respectively were spent in clearing off arrears of 1902; the former is not included in the above statement.

The following were the principal sites protected:-

4th Circle.—Wasta. Geziret El Masada & Head of Sultani Canal.

5th Circle.—Kasr Canal Head.

Girga Directorate.—Sohag, Qaramta and Kikata, Asyut and Sohag.

Asynt Barrage Directorate.—Mangabad, Abnub, Ekrad and Wasta.

The following expenditure was incurred in revetting canal banks below regulators and other important points:—

CIECLE	New :	TONE	Transport and	(F 4-) (1 -)
\$ 2 80 \$ 6.0 tou	Cube.	Cost.	Govt. Stone.	Total Cost.
	f_M.	1.H.	1.E.	L.E.
4th Circle	8,044	2,646	168	2,814
5th Circle	801	221	159	381
Girga Directorate	1,145	240	46	286
Asynt Barr, Directorate	3,826	765	_	765
Totals	13,816	3,875	371	4,216

The following were the principal points where revetment was done:-

Minia Province.—Canals Nazlet Diab and Etlidem, Nazlet El Abid Regulator on Yusufi.

Beni Suef Province.—Mazurah Regulator on Yusufi.

Fayum Province.—Bahr Seilah, Yusufi Canal at Fayum town, and various small canals.

Aswan Province.—Ramadi Canal.

Girga Province.—Bayyaras of several regulators.

Asyut Province.—Ibrahimiyah Canal, Delgawi-Yusufi bank.

In the Asynt Barrage Directorate 9,478 M<sup>3</sup> of stone were collected for the Asynt Barrage Reserve, at a cost of L.E. 1,660 in addition to the above.

#### SECTION II.—NEW WORKS AND IMPROVEMENTS.

(Exclusive of Special Works).

Earthwork.—The quantity and cost of earthwork executed in new channels and banks was as follows:—

CIECLE	Cube.	Cost.
	C.M.	L.P.
4th Circle	202,631	2,894
5th Circle	- committee	_
Girga Directorate	47,491	630
Asynt Barrage Directorate	64,708	776
Total	314,830	4.3(%)

The lengths of the new channels and banks are given in the following statement:—

Change	LENGTH IN KILOMETRES.			
CIRCLE.	New Channels,	New Banks		
th Circle	46,691	2,014		
th Circle		_		
lirga Directorate	9,014	0,981		
Asynt Barrage Directorate	-	1,185		
Total	55,105	4.183		

The details are given in Appendix E: all the works were petty.

Basin Bank Protection.—Appendix K shows the progress made with and expenditure incurred on, revetting basin banks.

In the 4th Circle a length of 1003 metres was revetted on salibalis Quinadir and Shushah at a cost of L.E.1732. In the Girga Directorate 5493 metres of new revetment was executed at a cost of L.E.2852 and L.E.338 was spent of repairs to existing work.

In the 5th Circle and Asynt Barrage Directorate no basin bank revetment was done.

Owing to the conversion of the Asynt and Minia basins the banks have been suppressed and the stone used in the conversion works: the total up to date is therefore misleading, and will be adjusted when all conversion works are completed.

New Masonry Works for Irrigation.—A list of new masonry works and buildings charged to the Ordinary Budget is given in Appendix B.

In the 4th Circle the principal expenditure was on the Walidiyah Syphon, where the pipes were successfully sunk across the canal, but it was found impossible to connect the end pieces owing to a heavy slip of the Ibrahimiyah Canal bank round the wooden coffer dam constructed at the north end, and to the early rise in the river; the pipes will be raised in 1904 and the end pieces attached before they lowered. The expenditure was L.E.1162 and up to the date L.E.5503.

In the 5th Circle the two principal works were a regulator in Salibah Hod El Gabbana and El Maamal Sayyala Head for Hod Edfu, costing respectively L.E.300 and L.E.548.

In the Girga Directorate no new works were built.

In the Asynt Barrage Directorate two small regulators were built at n cost of L.E.143.

The total expenditure under this head was L.E.3200.

Masonry Works re-modelled and repaired.—A list of the masonry works remodelled or repaired is given in Appendix C. The total expenditure under this head was L.E.14.584.

The principal work undertaken was the repairs to the Tulibat Regulator on the Sohagiyah Canal which had been outflanked during the previous flood: a sum of L.E.6357 was spent in its restoration, leaving arrears of L.E.520 to be paid in 1904; this regulator has stood well during the flood.

The rest of the expenditure was for the usual maintenance and petty repairs of masonry works and buildings.

#### SECTION III.—AGRICULTURAL ROADS.

Nothing was done in 1903 for the construction of new roads in the Fayum in connection with the programme drawn up in 1898.

These reads are purposely being held up until the main lines of canals and drains in the remodelling projects are fixed: the remaining

roads will probably be taken in hand in 1904. A small expenditure of L.E.3 only was incurred for land taken up in past years. The usual budget allotment of L.E.1050 was spent on repairs to old agricultural roads in the four provinces of the 4th Circle: this sum is quite imalequate for keeping the roads even in decent repair.

In the Asynt Province a project for the construction of new agricultural roads to serve the converted basins was accepted by the Provincial Conneil in August 1903 and the Decree of Conneil of

Ministers giving final approval was issued in November 1903.

The total length of the proposed roads is 64 kilometres and the estimated cost L.E.19,250. The project was prepared by the Project's Circle, but will be executed by the 4th Circle.

In the Minia Province a project was drawn up by the Project's Circle for the construction of new agricultural roads to serve the converted basins. The project comprises 28 roads extending over a length of 259 \(\frac{1}{4}\) kilometres of which 171 \(\frac{3}{4}\) are new and 86 \(\frac{1}{2}\) ald. The estimated cost of the 172 \(\frac{3}{4}\) kilometres of new roads is L.E.47,325 giving an average of L.E.274 per kilometre. At a meeting held at the Madirieh in April 1903 the project was agreed to and it was proposed to spread the cost over the whole of the lands situated on the west of the Nile: the area amounts to 363,000 feddans and the share per feddan is L.E.0.135.—The project is now held up, pending the decision of the Daira Sanich Administration regarding their contribution.

#### SECTION IV.—BRIDGES TO REPLACE FERRIES.

In the 4th Circle a new bridge with iron screw piles and masoury abutments was built at Abu Kerkas to replace the old wooden structure which had collapsed: its cost was L.E.1047.

A contract was also placed for the construction of a similar bridge across the Yusufi in the Faynun town, but no payment was made is 1903, though a considerable portion of the work had been done.

In the Project's Circle a new masoury bridge was built on the Ibra-

himiyah canal at Sidds at a cost of L.E. 260.

A contract was also made for the construction of masonry and iron bridges on the Ibrahimiyah canal at Beni-Mazar. Aba, and Sheikh Ziad during the closure in December 1903: a sum of L.E. 1350 was spent on these, the balance is to be paid in 1904.

The total expenditure under this head was L.E. 2657.

In the Girga Directorate 18 bridges on masonry abatments and piers and steel joists carrying a wooden platform were built at a cost of L.E. 6555. Altogether 51 bridges have been built against the original programme of 49, and the balance of money available will be used up in building others. These bridges are paid for by a cess on the entivated area of the Girga Province.

#### SECTION V.-WORKS OF PRIVATE ENTERPRISE.

Agricultural Railways in Fayum Province.—During 1903 no new lines were made: some bad curves were eased and a short length of track doubled at Metartaris station: the telephone posts were transferred to the side of the roads on which the rail track runs.

Nile Land Reclamation Works.—Mr. Dempster, Chief Engineer of the Nile Land Reclamation Works Co., writes as follows on the works undertaken in 1903:—

- "Garf Sarhan Reach.—A masonry needle regulator with 25 openings of 3 metres each has been constructed at the tail of this reach, by means of which the flow of water is under command and is regulated to the velocity best suited to the deposit of silt. The flood of 1903 was but a moderate one and barely rose high enough for our wants. However, about one part in every 1000 of discharge was abstracted from all the water passing through the regulator and fairly good results were obtained."
- "Saudat Reach, near Mellawi.—Here a masonry regulator of 120½ metres, plus wooden girds 180 metres in length were constructed at the lower end of this reach. A much smaller percentage of the silt was deposited, though larger quantity in all was found within the reach, due to the much heavier discharges passed. Satisfactory deposits of pure clay were found at the lower end of the reach, though much sand was found at the top of the reach."
- "Ro lah Reach.—Here also a masomy regulator 99 metres in length worked with wooden needles has been used to modify the velocities required for the best deposit of silt. A higher flood here, as at Garf Sarhan, would have suited our purposes better, but a good even deposit of pure clay has been obtained all over the reach. About 55 parts out

of every 1000 of discharge were measured as deposited in the reach as the results of this year's operations.

"Sheikh Fadl Reach—near Beni-Mazar.—A similar regulator as that employed at Rodah has been successfully worked in this reach during the year. The deposit has been fairly even and good, though much

sand is found towards the top end of the reach."

This Company has spent a considerable sum of money in the construction of substantial works, which, in addition to the reclamation of the land, have certainly improved the navigable channels of the river: a good many difficulties have been encountered, especially as regards the ownership of the land reclaimed, but with encouragement it is hoped the results will be satisfactory.

#### SECTION VI.—EXPENDITURE.

An abstract of the expenditure is given in Appendix A, and is as follows:-

20.000 0	and Contingent Charges		38,541 685,026
		Total	 L.E. 723,567

#### SECTION VII.—ESTABLISMENT.

At the commencement of the year the post of Director General of Reservoirs was abolished, and the whole of the works came under the

charge of the Inspector General of Irrigation.

A new directorate was formed for the Aswan Reservoir with Mr. Macdonald as Director, and a staff of European engineers and mechanics. Similarly the Asyat Barrage Directorate, comprising the Asyat Barrage, and portious taken from Girga directorate and 4th Circle, was formed with Mr. Waghorn as Director.

Mr. Clowes, in addition to very heavy work in the 4th Circle, also held charge of the post of Inspector General during my absence on leave.

Mr. Ireland took charge of the 4th Circle during the flood, when Mr. Clowes was on leave, and carried through the complicated Sarf operations very creditably. At the end of the year he was appointed to the newly created Zifta Circle. He had a thorough knowledge of

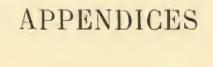
the 4th Circle, where he was much liked and respected: his departure will be widely felt.

Sidky Bey and Hussein Bey Wassif held charge of the 5th Circle and Girga Directorate respectively throughout the year, and successfully carried out the flood irrigation.

Abdallah Bey Wahbi did very good work on the remodelling projects of the Favum.

Ismail Pacha Sirri held charge of the Project's Circle throughout the year, and carried out most successfully the very heavy programme of works in connection with the basin conversion Projects.

A. L. WEBB.





APPENDIX A.

Abstract of Expenditure is 1903 under the different sub-heads of the Budget.

SUB-HEADS OF BUILDET.			EXPEN	DITURE.		
SCB-HEADS OF BURRET.	4th Circle.	Projects.	5th Circle.	Girgu.	Aevut Bar, Dirte.	Total.
Sub-Chap. I.—Establishment.	In E.	In En	L.E.	Is.III.	L.E.	L.E.
Classified Hors Cadre	8,942 5,265	1,870	4,359 1,340	3,744 1,163	886 1,990	19,798 9,758
Total, Sub-Chap. I	14,207	1,870	5,699	4,901	2,876	29,556
SUBCHAP. II.						
Travelling Allowance Telegrams Dahabiyahs Office Rent and water Sundries	3.628 227 131 239 10		1,358 234 461 40 49	1,192 156 148 460 18	223 18 - 286 5	6,401 635 740 1,025 82
Total, Sub-Chap. II	4,235	_	2,142	1,974	532	8,883
Sue-Chap. III.						
Furniture and instruments	63	_	40	67	_	170
SUE-CHAP, IV.						
New works	228	_	1,189	900	143	2,7(i()
Sul-Chap. V.						
Repairs and Maintenance	8,630	_	3,017	5,005	8,058	24,710
Sub-Chap. IV and Corver Abolit.						
Earthworks and works for de- creasing the cost of mainte- nance of banks and channels Special new works	60,739 2,411	_	37,500	32,568	17,757	148,564 2,411
Common till and the second	69,935	419,645	4.000			
New Agricultur, Roads & Bridges	3	415,010	-3-(10.0)	6,555	_	493,580 6,558
SPECIAL LOW FLOOD CREDIT	_ "		897	681		1,578
FERRY FUNDS	1,047	3,500	_	_	_	4,517
SUMS COLLECTED UNDER CANALS ACT.	51	_	110	101	_	251
Total of Works	143,014	123,145	16,702	45,810	26,258	684,959
Grand Totals	161,549	125,015	54,583	52,755	29,666	723,568

# APPENDIX B.

LIST OF NEW MASONRY WORKS EXECUTED IN 1903 AND THEIR COST, EXCLUSIVE OF SPECIAL WORKS.

NAME OF WOLK.	Cost.	Total per Province,	Total per Cirele.
4 (47.55/57.75	L.E.	L,E,	IE.
4TH CIRCLE.			
FAYUM PROVINCE.			
Abu Gaudir and Serb Inspection houses	200 28	228	
ASYUT PROVINCE.			
Walidiya syphon	1,162	1.162	* *****
5TH CIRCLE.			1,390
KENA PROVINCE.			
Saliba El Gabbana Regulator Teima culverts New store at Abu Hamad Escape Nilometre at head of Killabiyah Canal Khuzam Sayala syphon head	153 50 50	F.113	
ASWAN PROVINCE.		582	
El Manual sayala head Sayala hod Bimban culvert Selwa road bridge Nilometre at head of Ranuadi Canal	548 107 80 50	785	
ASYUT BARRAGE DIRECTORATE.	_		1,367
ASTUT PROVINCE.			
Regulator Gisr El Huraz	340		
		113	113
	Grand Total	•••	3,200

# APPENDIX C.

LIST OF MASONRY WORKS REPAIRED AND REMODELLED IN 1903 AND THEIR COST.

		Total	Total	
NAME OF WORK.	Cost.	\$MIT	let	Grand Total.
		Province.	Circle.	
	I. E.	LE	L.E.	t <sub>n</sub> E,
A CATTA CAT TO				
4TH CIRCLE.				
ASYUT PROVINCE.				
Petty repairs to Bridges	200			
Repairs and alterations to Head Quarters	200			
0 (1)	100			
Supply of regulating planks	316			
Repairs to Hasaybah Bridge	176			
" Deirut escape	232			
į-		1,224		
MINIA PROVINCE.				-
	-3/1/1			
Repairs to Inspection houses	200 500			
Repairs to C. E. office (arrears)	239			
Repairs to pipe culvert in W. Hafiz Ganna-				
biyah	110			
		1,049		
Dan Cara D		8.91738.07		
BENI SURF PROVINCE.				
Repairs to Koshesha escape (arrears)	131			
Syphon on Muhit drain	150			
Painting ironwork Petty repairs to Bridges	$\frac{114}{580}$			
Repairs to Mazurah Regulator (arrears)	160			
pipe syphon under Magnuna Canal	80			
Iron Syphon under Bahabshin Canal	310			
Painting Kosheshah gates	106			
-		1,631		
FAYUM PROVINCE.				
Petty repairs to Bridges	500			
Repairs to Inspection houses	200 150			
Kasr Gobali Reidera	146			
Pipe syphon El Gib drain	128			
Tunnivah and Avat road bridge	100			
Three culverts on Bahr El Nezla	277			
		1,501		
Carried forward			2 1.12	
Carried forward			5,405	

List of Masonry Works Repaired and Remodelled in 1903 and their Cost (contined).

Name of Work					
Strict Circle.   Stri	Name of Work	Cost.	per	per	Grand Total,
STH CIRCLE.   KENA PEOVINCE.		L.F.	L.N.	L.E.	L.E.
Repairs to Maalla Rest house	Brought forward			5,405	
Repairs to Maalla Rest house   34   36   36   36   36   36   36   36	5TH CIRCLE.				
Repairs to Maalla Rest house	Kena Province.				
Miscellaneous petty repairs	Repairs to Maalla Rest house  "Nag Hamadi house "Hisha Escape  W. Branch Rannan Canal Head Regulator Escapes Hods El Sahara E. and W. Repairs to El Numasa Regulator "El Dimiqrat Regulator "Isna Rest house "Qus Rest house and store "Hod El Rakaik enlyert "El Massab culvert "El Mussalha enlyert "El Gebalan escape "El Tadilivalı Canal Head	36 100 20 35 36 17 32 20 12 11 12 23 15	557		
GIRGA DIRECTORATE.  GIRGA PROVINCE.  Repairs to Awlad Yehya Escape	Aswan Province.				
Griga Province.  Repairs to Awlad Yehya Escape	Miscellaneous petty repairs	43	4.3	GOO	
Gera Province.  Repairs to Awlad Yehya Escape	GIRGA DIRECTORATE			6,005	
Repairs to Awlad Yehya Escape					
2011	Repairs to Awlad Yehyu Escape  " Isawiyah syphon " Samanu West regulator " Bayadi Syphon " Enebis Escape " Araba Idfa Escape " Sahil Awlad Khalaf Culvert " Un Dumah E. Escape " W. Escape " Fulihat Regulator	131 86 22 27 22 20 25 50 6,357	7.032		
	Carried forward ,			13,017	

LIST OF MASONRY WORKS REPAIRED AND REMODELLED IN 1903 AND THEIR COST (continued).

Name of Work	Cost.	Total per Province.	Total per Circle.	Grand Total.
Brought forward	L.E.	L.E.	L.E. 13,017	Zan Fin
ASYUT 2ND SECTION.  Badari Salibah Regulator Madmar Escape Aqadma Regulator Abu Tig Escape Tisaa Regulator Sultani Culvert Shutb Escape Selim Escape Miscellaneous Petty Repairs	15 21 91 123 74 111 12 26 27	500	500	
Asyut Barrage Directorate.  Repairs to Abnub Bridges  "Asyut Bridges  "Maufalut Bridges  "Deirut Bridges  Miscellaneous Repairs	399 150 200 200 115	1,064	1,064	14,581

# APPENDIN D.

EARTHWORK IN MAINTENANCE CHARGED TO REGULAR AND CORVÉR BUDGETS, UPPER FOVIT, 1903.

Cost.	Loke	2001 2001 21001 21001	-18,045	35. 35. 35. 35. 35. 35. 35.	36,072		17,477	23,063			16,237	123,117
Purat.	G.M.	1.05.12.12.12.12.12.12.12.12.12.12.12.12.12.	060,608,5	2,162,376	2.883,966		5330,536	2,071,749		678,388 100,000	738,388	9,560,093
Require to ogricultu- rai made.	6.84.	1111	1				11			1 1	1	1
New canals and banks.	C,N;	1111					11	1		64,708	64,708	64.708
Solls	C.M.	19976	12,276	66.455	107,514		11,751	11,751		11		131,541
Closing of suits,	15,31.	109.95 019.95 10.8	18,930	13,192	13,440		14,012 9,493	25,505		56,055	56,055	143,930
Chearmes of Sell drains and new drains.	C.M.	28.25 25 25 25 25 25 25 25 25 25 25 25 25 2	267,330	11	j		[ ]			1 1	-	267,330
Clearance of	CN:	211,365 130,221 515,636 521,950	1,685,172	3,896	5.8.6		1 [	1		100,000	100,000	1,789,068
Observates of Nill counts and drains.	CM.	309.001 222.001 29.483	560,556	1,971,215	2,611,147		1,154,248	1,462,539		268,1291	268.120	4,935,631
Repairs In lanks.	C.M.	180,121 528,451 491,685 91,396	1,291,726	107,618	114,669		212,406	571,934		241,496	249,496	2,227,825
PROVENCE	4rn Chena	Fayum Beni Suef Minin Asynt	Total, 4th Circle	Бти Систе. Кени	Total, 5th Circle	GIRBA DIRECTORATE.	Asyut 2nd Section	Total, Girga Directorate	ASYLT BARRAGE DIRECT.	Asynt Dredging Ibrahimiyah Canal	Total Asynt Barrage Direct.	Grand Total

# APPENDIX E.

STATEMENT SHOWING THE NEW BANKS AND CHANNELS MADE IN 1903, EXCLUSIVE OF "SPECIAL WORKS."

Name of Work.	Longth in kilometrys.	Quantity of earthwork.	Total quantity.
4TH CIRCLE.		С.М.	C.M.
Diversion of Nile banks	2·014 1·500 1·484	38,676 12,969 3,780	55,425
FAYIM PROVINCE.			
New branches Bahr El Maqatla Bahr El Balad Diversion Bahr El Moarrabin Extension channel El Azab Bahr Arus remodelling East Bahr Etsa Channel for Malag Magoon Bey at Minia Channel Abn Radi at Minia Bahr Abuxa at Esbet El Khor Remodelling Bahr Abuxa Remodelling Bahr El Wakf	16:964 3:096 4:625 1:152 3:250 1:144 3:200 1:832 0:140 3:253 8:054	26,694 10,956 2,880 1,286 838 124 8,879 9,000 555 83,751 51,943	117,206
Total 4th Circle		_	202,631
GIRGA DIRECTORATE.			
GIRGA PROVINCE.			
Extension of Sayalet Nag Tammam E. Sayalet Hod Banahu Sayalet Giziret Sawama Diversion of Nile Tarrad Extension of Sayalet Geziret Awlad Salim	0.856 1.610 1.000 0.984 0.743	4,060 7,874 10,318 15,662 9,227	
ASYUT 2ND SECTION.			47,141
Extension of masraf Hod El Duer	4.805	10:350	10,350
Total Girga Directorate	_	_	57,491
Carried jorward	_	. –	260,122

# STATEMENT SHOWING THE NEW BANKS AND CHANNELS MADE IN 1903, EXCLUSIVE OF "SPECIAL WORKS"—continued.

Name of Work.	Length tu kilometres.	Quantity of earthwork.	Total quantity.
Brought forward	_	с.м.	см. 260,122
ASYUT BARRAGE DIRECTORATE  Diversion Salibah Beni Rafi	0·242 0·752	13,348 16,246 11,926	301,642

#### ABSTRACT.

New Channels,	New Banks.	Expenditure.
Kilometres.	Kilometres.	L.E.
46.691	2.014	2,894 639
- 1/14	_	483
_	1.189	483
55 • 705	4.183	4,016
	Kilometres,  46.691 9.014	Kilometres.  46.691 2.014 9.014 0.984 - 1.185

# APPENDIX F.

GENERAL ABSTRACT OF EXPENDITURE ON "SPECIAL WORKS" CHARGED TO SPECIAL CAISSE CREDIT AND SPECIAL GRANT FROM ORDINARY BUDGET.

			E	XPENDITUR	RE.			
NAME OF PROJECT.	Name of Work.	Ordinary Budget.	Caisse Credit.	Total per Work.	Total per Project.	Total per Circle.		
	ITH CIRCLE.	L.E.	L.E.	L.F.	I.E.	In Ea		
West Hafiz Ganabiyalı	Land	-	66	63	G.			
Walidiyah Syphon, {	Walidiyah syphon under Ibrahl- miyah	-	(50)(a	610	(30)			
Asynt Converted Rasius.	Pitching	- 42 - 611	419 1.272 1.255	619 1,314 1,253 611	3.799			
Fayum Remodelling Projects.	Establishment Land for canals Earthwork in canals Masoury in in canals Bevetment in canals Demarcation stones Fronwork Earthwork in drains Masoury in drains	=	2,526 1,052 35,373 13,650 803 40 7,000 6,080	2,526 1,632 35,373 13,650 803 40 1,313 7,000 5,080 445	67,882			
Railway diversion	5TH CIRCLE.					72,316		
Hod Hamad.	Earthwork	_	3,650	3,(23)	3,030			
Aswan district canals.	Earthwork	-	370	370	370	1,888		
	PROJECTS CIRCLE.							
Asynt Basins   Conversion.	Cost of land		3,100	3,100	3,100			
Southern Minin Basins Conversion.	Strengthening canal banks Masoury works Irrigation outlets Stone for Bahr Yusuf Cost of land Working canals	785	11,730 7,052 334 1,435 37,029	11,730 8,447 384 1,435 37,020 1,027	. Gn <sub>1</sub> 002			
	Carried forward	. –	_	_	63,102	76,846		

GENERAL ABSTRACT OF EXPENDITURE ON "SPECIAL WORKS" CHARGED TO SPECIAL CAISSE CREDIT AND SPECIAL GRANT FROM ORDINARY BUDGET (continued.)

		Expenditure				
NAME OF PROJECT	NAME OF WORK.	Ordinary Budget,	Calaso Credit,	Total per Work.	Total per Project.	Total per Circle.
		I.E.	I.E.	rk.	L.E.	L.H.
	Brought forward	-		_	63,102	76,316
Northern Minia Basina Conversion.	Conversion works	1,800 970	151,300	153,100 970	154,079	
West Glzeh Basins Conversion.	Printing west Gizeh maps Stone for Lahun Canal	250	4,490	250 4,490	4,740	
Widening Ibrahlminh Caual.	Widening Delrut to Minia  Minia to Matay  Matay to Mayana  Revenment Minia Etsa  Land-Minia-Matay	201	33,999 40,485 17,767 2,161 6,907	33,999 40,485 17,762 2,151 6,907	101,510	
Remodelling ) Muldt Drain.	Remodeling Etsa to Salibah Kom Saaydah and Abang drain Land Sabakhah-Etsa	365	50,784 1,601	51,149 1,601	52,750	
Etsa Pumping Station.	Buildings	5(8) 620 485 	19,521 2,659 1,612	20,051 620 8,144 1,652 461	25,834	
Temporary establishment and justly expenses,	Establishment and petty expenses Portable wooden houses	466	15,459	15,489	15,955	415,034 *
	Grand Total	361.078	_	_	_	491,380

<sup>\*</sup> Includes L.E. 60,712 advanced by Finance Department to be recovered from Calase Grant of 1904.

# APPENDIX G.

LIST OF MASONRY WORKS EXECUTED UNDER "SPECIAL WORKS" GIVEN IN APPENDIX F.

				Cost.	
NAME OF PROJECT.	NAME OF WOI	eK.	Per Work.	Total per Project.	Total per Circle
			L. K.	IH.	Los Koo
	4TH CIRCLE	>-			
Walidiyah Syphon.	Completing Walidiyah Syph- miyah Canal	ou under Ihrahi-	600	(\$(W)	
	Pitching		1119 12		
Concession of Asynt Basins.	Three culverts and remodellingulator		659		
A 246.7 \$ \$ \$ 7.0	Three road bridges on canals		100 513		
l	Iron and wood work	** *** *** ***	611	2,514	
	Canale;				
	Demarcation of land on Caus	l A. Wahbi — 3rd	40		
	a2 Masobry works on Bahr ?	wilah	6,070 7,580		
	23 Masonry works on Bahr 2 Revetment on Sellah system.	erb	803		
Fayum Remodelling.	Iron work		1,313		
	Draine :				
	Falis below Khazzan Tamiya	h	660		
{	Masonry works on Seila syste Iron work	· · · · · · · · · · · · · · · · · · ·	4,420 445	21,331	24,475
				41 <sub>1</sub> 001	21,113
	PROJECTS CIRC	LES.			
(	22 Regulators	.1 40			
Southern Minia Basins Conversion.	13 Head Shilers 12 Escapes				
manns Conversion,	8 Road Bridges		8.212		
,	2 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		17,212	R,212	
(	26 Regulators				
Northern Minia Barine	78 Head Sluices				
Conversion	53 Drainage inlets				
	17 Syphone		50,037	50,037	
Widening the	S Hend Sluices		1.095	(317,1313.1	
Ibrahimiyalı.		P1	1,0%	1,095	
Remodelling	2 Regulators				
Muhit drain.	20 Road Bridges		17,805		
_	2 Entiwhy Bridges		Ta <sub>4</sub> NO <sub>i3</sub>	17,803	77,149

#### APPENDIX H.

LIST OF NEW AND REMODELLED BANKS AND CHANNELS EXECUTED UNDER "Special Works" given in Appendix F.

		Length	Quantity	Cos	ST.
NAME OF PROJECT.	NAME OF WORK.	iu kilometres.	of earthwork.	Per work.	Total per Project.
	4th CIRCLE		C.M.	L. E.	T. E.
Asynt Rosins (Conversion,	Banks	3,3/ii) 3,5/iG 15,237	18,235 15,428 50,278	1,255	1.253
	Canals: 2md Reach A. Wahli	22,224 17,500 39,000	1,142,298 536,226 486,653	15,992 8,312 7,300	
	Remodelling Bahr Maquita and branches	18,934	251,333	3,770	-
	Remodelling Bahr Seila and Roda systems	79,478	479,169	7,000	12,374
	Total 4th Circle	199,438	2,985,615	43,629	43,629
	PROJECTS CIRCLE				
Southern Minia	New channels Strengthening banks	37,250	431,640 480,344	8,300 6,478	14,787
Northern Minia. Basins Conversion.	Canals	310,500 230,500	5,154,266 595,718	88,795 11.021	99,616
Widening the Ibrahlmiyah.	Delrut to Minia		1,115,074 1,004,900 1,040,593	22,121 39,699 16,895	. 78,715
Remodelling ) Mulit drulu.	Etsa to Salibah Kom Saaydah am Abang drahu		2,043,013	36,318	34,318
Etaa Pumping Stations.	Delivery channels	. –	27,0%)	504	604
	Total Projects Circle	0-00	12,256,728	230,140	230,140
	3th CIRCLE				
Railway diversion 1 110d Haund. )	Straightsuing bank	0,604	_	3,630	3,030
Aswan Districts Counts.	Small channels	-		370	370
	Total 5th Circle			4,000	1,000
	Grand Total	-	_	_	277,769

#### APPENDIX K.

#### REVETMENT OF BASIN BANKS WITH STONE.

	Ly	NOTH REVETT	ED,	EXPENDIT	CAR DURING	THE YEAR.
Province.	Previously reported.	Added during 1908.	Total to date.	New Revelment.	Bepairs.	Total Expenditure.
	M.	М,	M.	LEL	I.F.	I.E.
4TH CIRCLE.						
Beni Suef	40,329	_	40.329	_	_	_
Minia	89.069	1,003	90.072	1,395	337	1,732
Asyut	59.236	_	59.236	_	_	-
Total	188,634	1.003	189,637	1,395	337	1,732
GIEGA DIRECTORATE.						
Girga	47.253	2.397	49,650	1,219	170	1,389
Asynt 2nd Section	50,203	3.096	53.299	1,632	169	1,801
Total	97.456	5.493	102.949	2,851	339	3,190
Grand Total	286,090	6.496	292.586	4,246	676	4,922

## APPENDIX M.

Statement showing the Area under different (hops in Upper Egypt, including Government and Wakes Land AND LAND OF THE DAIRA SANIEH AND DOMAINS, FROM SEPTEMBER 1903 TO AUGUST 1904.

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	NAME OF PROVINCE		Beat Suct	Fayum	Minh	Aryut	dirga	Kons	Авман	Fee

#### APPENDIX S.

TABLE L.—Statement showing the quantity of Sugar-cane chushed in the Daira Sanieh Factories in Muddle and Upper Egypt in Season 1903-1904 and the amount of No. 1 Sugar produced.

	Name of Factory.		Cane crushed in kantara.	Outturn of No. 1 Sugar in kantars.
	MIDDLE EGYPT.			
Biba				129,016
Matai			1 ()** 4 1 *);*	183,002
				-
Abu Qirqas Roda				211,957
	Total, Middle Egy	pt	5,842,312	523,975
	UPPER EGYPT.			
Dabaiyah				dona
Armant	*** *** *** *** *** ***		–	_
Mata'anah	*** *** *** *** ***	• • • • •	994,307	104,281
	Total, Upper Egy	pt	991,307	104,281
	Grand Tot	al	6,836,619	628,256

#### APPENDIX S-continued.

TABLE II.—Sugar-cane crushed and Sugar out-turned by the Daira Sanier Factories during the last twenty-five years.

Factory senson.	From crop of.	Quantity of cane crushed in kantars.	Total sugar produced in kantars.	Nature of summer level preceding factory season.	REMARKS
1880	1879	8,402,833	605,623		
1881	1880	2,365,642	182,096		22
1882	1881	7,336,192	603,225		and 3.
1883	1882	4,880,094	422,622	Unfavourable,	E 21
1884	1883	8,445,247	667,451	Favourable.	
1885	1884	9,918,201	854,884	Very favourable,	
1886	1885	11,258,057	973,500	Pair.	N. O.S.
1887	1886	10,986,224	934,376	Favourable,	E
1888	1887	10,411,640	951,352	Favourable.	=
1889	1888	8,382,837	790,197	Fair,	
1890	1889	7,602,302	695,870	Very favourable.	ಕ್ಕಿ
1891	1890	11,130,799	1,149,893	Very low,	thr
1892	1891	12,522,918	1,329,627	Low but early rise.	2
1893	1892	12,755,107	1,207,164	Low and late rise,	7
1894	1893	14,253,813	1,427,608	Very favourable.	rde
1895	1894	14,601,832	1,385,345	Favourable.	nelt.
1896	1895	15,217,050	1,564,972	Very favourable.	=
1827	1896	13,253,433	1,882,979	Very favourable,	100
1898	1897	12,369,140	1,176,067	Very favourable.	och
1899	1898	11,636,689	1,173,871	Low.	sugar produced includes the three qualities
1900	1899	12,680,860	1,340,983	Very favourable.	1
1901	1900	9,680,482	1,057,902	Very low but early rise.	= =
1902	1901	9,649,009	1,081,967	Very low rise early, but	The total
1903	1902	9,144,560	944,643	Very low with late and feeble rise,	he t
1904	1903	_		- recute tree,	€

#### APPENDIX S-continued.

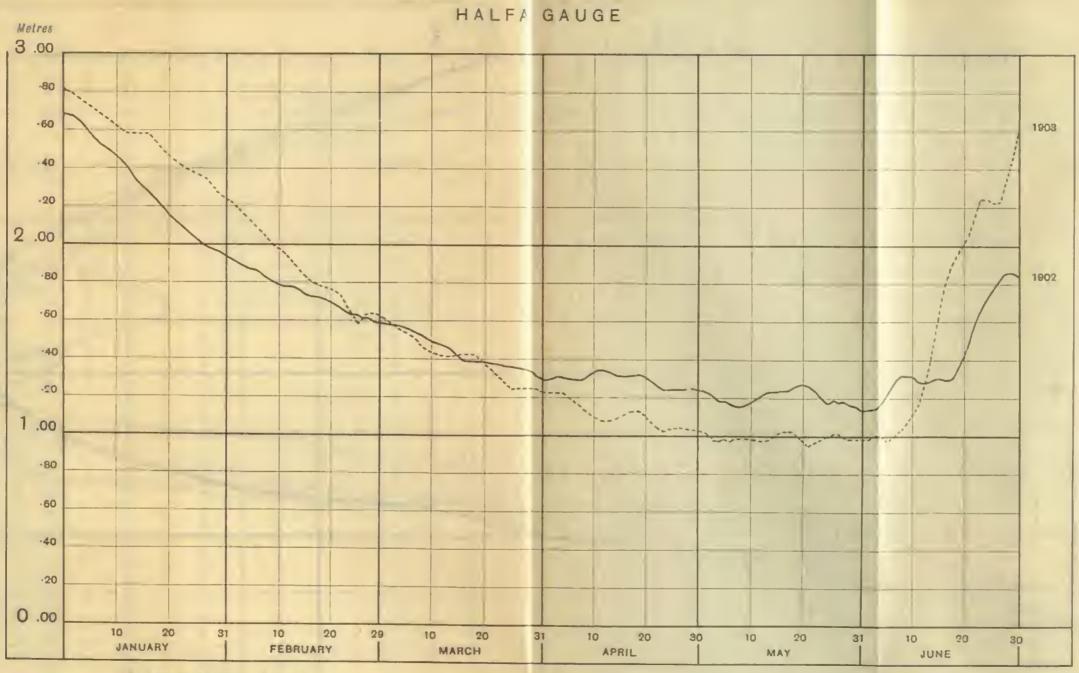
TABLE III.—Sugar-cane crushed and Sugar outturned in Sultan Pasha's Factory at Damaris during the last twenty-one years.

Juctory Senson.	From crop of	Quantity of case crushed in kantars.	Total sugar produced in kantars.	REMARKS.
1884	1883	258,855	23,199	21
1885	1884	258,405	24,720	
1886	1885	250,426	23,705	60
1887	1886	272,984	23,903	Z
1888	1887	274,549	23,636	ries Soit
1889	1888	276,505	24,648	The total sugar produced includes the threequalities Nos. 1, and 3.
1890	1889	266,218	23,783	edi
1891	1890	228,421	31,609	Fre
1892	1891	382,791	36,161	5
1893	1892	442,187	37,275	T .
1894	1893	471,076	40,253	neludes and 3.
1895	1894	545,274	47,429	an ach
1896	1895	587,462	59,543	.=
1897	1896	451,390	40,566	ace
1898	1897	479,822	48,761	Por
1899	1898	466,027	46,732	Ξ.
1900	1899	524,466	54,966	<u> </u>
1901	1900	410,465	44,700	7.
1902	1901	565,931	52,102	ofa
1903	1902			2
1904	1903	384,828	37,099	É

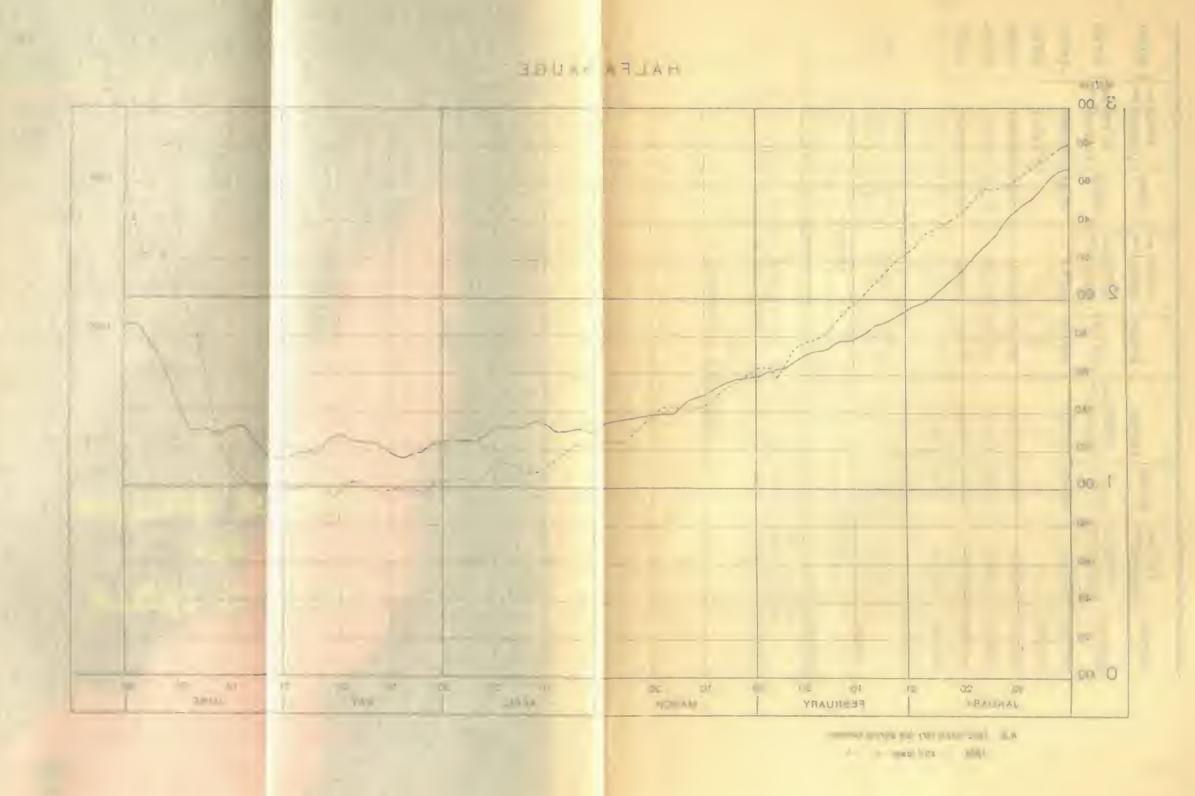
# APPENDIX S-concluded.

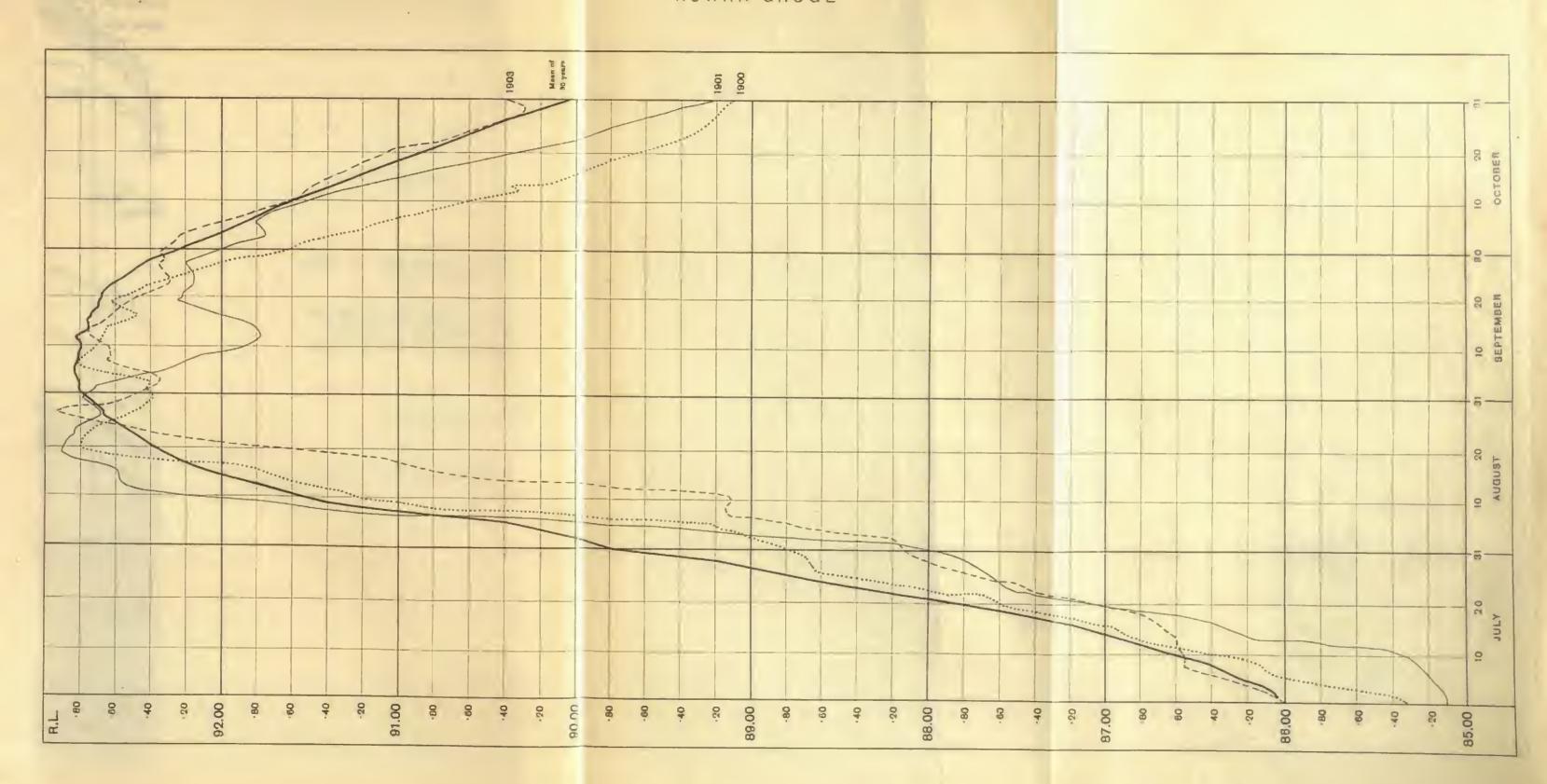
TABLE IV.—Statement showing this quantity of Sugar-Cane erushed in the Pactonies of the

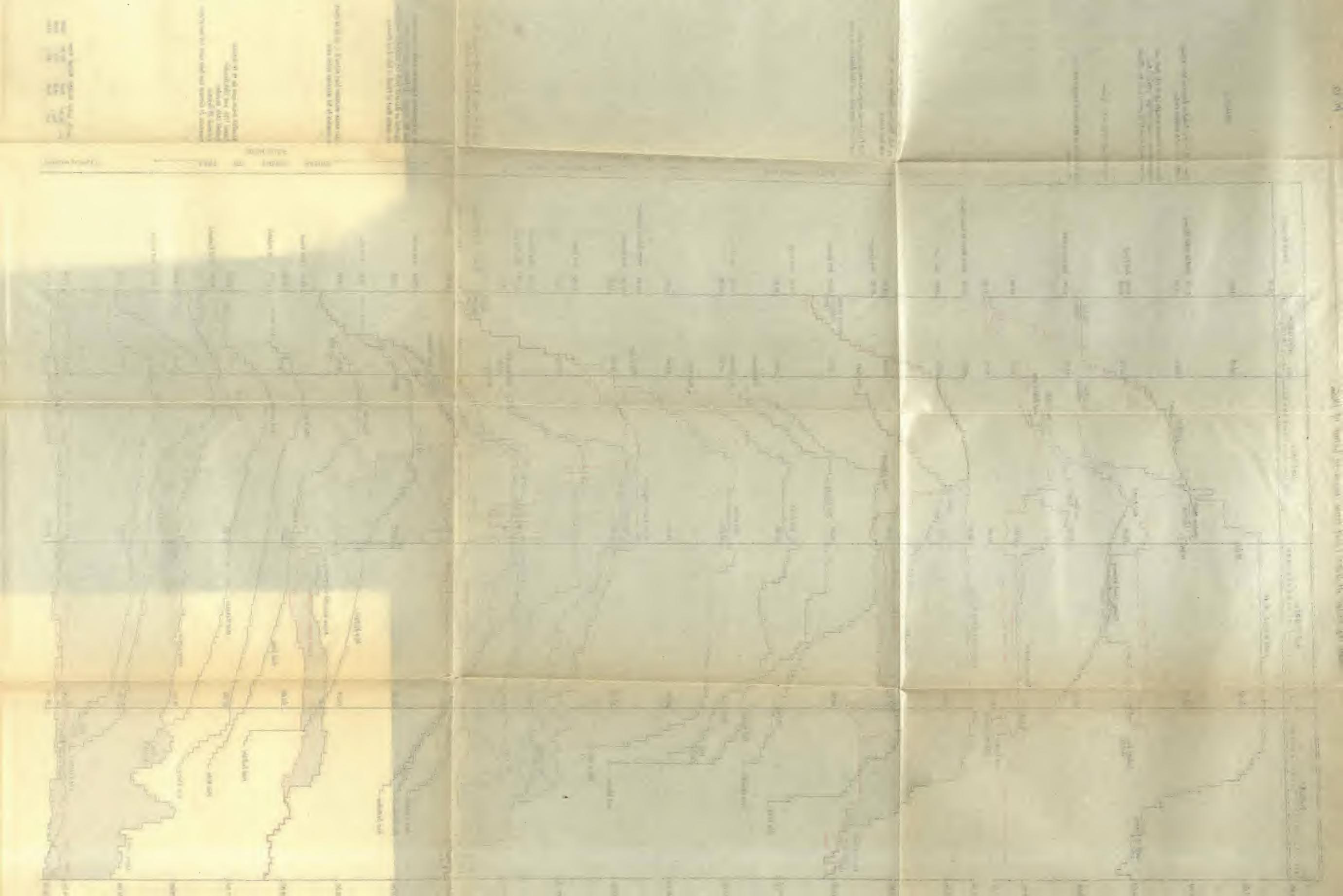
			FACTORIES	IEN.			1	
	Nagn Hamadi.	madi.	Shekh-Fadb	id).	Hawmuliyalı,	yalı.	TOTAL.	
SEASON,	Class errabed to kantara.	Philliam of Nia, 1 Sugar in Cartany.	Cano trushed to kantuck	Outurn of No. 1 Sugar in kantara	Cara ertudial	Onstarra of No. 1 Stagns in Kentary.	Canepruded In kandors.	Ontwen of No. 1 Sugar to knotner,
1890-1897	644,438	68,838	68,888 1,822,204	191,109	191,109 1,333,320	135,554	135,554 3,749,962	395,551
1897-1898 1,661,418	1,661,418	108,870	108,870 2,782,670	238,574	651,808	56,990	56,990 5,098,896	409,434
1898-1899	1898-1899 1,776,825	173,263	173,203 3,158,415	SH SH	381,919 1,315,080	125,790	125,790 6,250,320	604,002
1899-1900	1,618,311	168,252	3,169,252	301,191	301,191 1,191,278	105,641	5,978,871	575,400
1900-1901	}	1	1	1	1	1	6,908,779	682,587
1901-1902	3,231,460	265,600	265,690 3,505,617	283,164	916,471	54,067	7,658,548	• 642,8111
1902-1903	3,233,284) Cum 83,480) Res	315,977	3,487,123) Gass 182,283) Red	371,570	923,692) Care 94,553) Bet	108,038	7,614,099) cas:	195,585
1903-1901	4,603,863] gam	481.533	2,690,947	274,016	528,019) Case 15,315) Bed	62,482	7,822,829) Cana 49,872) Best	821,031



N.S. 1902 levels very law during summer 1903 >> still lower >> 4>







#### ADMINISTRATION REPORT

OF THE

#### IRRIGATION DEPARTMENT IN LOWER EGYPT

For 1903

BY

K. E. VERSCHOYLE,

INSPECTOR GENERAL OF IRRIGATION IN LOWER EGYPT.



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															1	MENS.
River levels	•••												***	***		117
Sadd Damietta Branch							•••									HS
Mehallet Ei Amlr Sadd.,	*10			•••												HIS
Atf pumping station			** *									**	***			119
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### ADMINISTRATION REPORT OF THE IRRIGATION DEPARTMENT IN LOWER EGYPT FOR 1903.

#### CHAPTER I.

#### WINTER, SPRING AND SUMMER IRRIGATION.

#### RIVER LEVELS.

As the Aswan Reservoir began to withdraw water from the river on the 20th October 1902, the levels on the Aswan gauge after that date cannot be compared with those of previous years. In future the Wady Halfa gauge will be the one used when comparing different years as regards the supply in the river.

The level on the Wady Halfa gange on the 1st of January 1903 was 2.80, which was 4 centimetres higher than the level on the same date in 1901, 12 centimetres higher than the level on the 1st January 1902, and 86 centimetres higher than the level recorded on the 1st January 1900, the year of minimum recorded summer supply. The mean level for the 1st January on the Wady Halfa gange for the past 12 years is 3.20, so that judging by this gauge the year did not open with very bright prospects as regards summer supply; in fact the only years on record which started with a lower level at Halfa were 1900, 1901, 1902. The level at Khartoum was, however, slightly more encouraging, being 26 centimetres higher than the levels for the same date in 1900 and 1902, though 10 centimetres below that of 1901.

The level at Khartonm fell steadily up to the 17th May, on which date the gauge reading was 10 centimetres lower than on the same date in the minimum year of 1900.

The rise commenced in a very satisfactory manner, so that by the 25th May the levels of the three previous years were surpassed at Khartoum, and the level of 1899, a year of good summer supply, was passed on the 29th May. The rise continued satisfactory up to the 18th June when a check, ending in a slight fall, occurred. By the end of May it was evident that the supply above the Delta Barrages might, irrespective of the reservoir supply, be expected to improve by the end

of June, and, with the nid of the reservoir supply at an early date in June, ereate a very happy state of affairs as compared with any previous year.

SADDS IN THE ROSETTA AND DAMIETTA BRANCHES OF THE NILE.

In anticipation of the assistance from the Aswan Reservoir, it was decided not to make the Faraskour Sadd in the Damietta Branch which had been made in 1900, 1901 and 1902.

In order to maintain the level above the sadd in 1902, it was found necessary to pass water into the river at Mansurah during May and the first half of June, and again from 12th July, and also to pass a small discharge through the Delta Barrage. The gross cube so passed into the river from April to July, was, as near as I can estimate on the data available, about 86,000,000 cubic metres, meanwhile, the 68 river pumps north of Mansurah were raising water at the rate of 1,356,000 enbic metres per day, i.e., they raised a total cube of 165,000,000 enbic metres between the beginning of April and end of July. the amount passed into the river at the Delta Barrage and Mansarah, which could otherwise have been utilized in the canals, we are left with 79,000,000 cubic metres as the amount of water derived from the pool above the sadd from the date of its closure up to the end of July. None of this cube would have been available without the sadd, as only the cube raised by the pumps north of Mansurah has been taken into account.

This cube of 79 millions would have sufficed to give 6 waterings to on area of 33,000 feddans of ordinary crops. The cost of the sadd was L.E. 5,000 which comes to P.T. 15 per feddan of irrigated area.

It appears from the above that, if the figures for the cube passed into the Damietta Branch are approximatively correct, there is a good deal to be said in favour of constructing this said, especially if it be decided not to feed the Rayyah Abbas and Mansaria Canals from above Zifta Barrage in the summer.

#### MEHALLET EL AMIR SADD.

The Mehallet El Amir Sadd on the Damietta Branch was made for the fourth year in succession at a cost of L.E. 7,871. The sadd was connuenced on 28th January and finally closed on the 20th May. A breach, which occurred in the portion crossing the deep channel on the east bank on 9th April, delayed the closure considerably.

The sadd was made with a crest level of 3.25 to hold up water to R.L. 2.50.

The volume of water withdrawn from the pool above the sadd is estimated as follows:—

By the 2nd Circle Canals	- • •		• • •		•••			39,281.500
By the Rosetta Canal Behera By Atf pumps	• • •				***	***	•••	13,169,421 15,393,618
By private pumps		• • • •		•••		***	•••	7,000,000
				Total				74,844,039

The sadd was cut on the 21st July.

The cube of 74,844,039 cubic metres would suffice to give three waterings to an ordinary crop of 62,370 feddans between the 20th May and end of July. The cost of the sadd being L.E. 7,871 the cost of irrigation per feddan works out to P.T. 13. It is well worth spending L.E. 7,871 to assure the crops and taxes on an area of 62,370 feddans.

#### ATF PUMPING STATION.

It was only found necessary to work the Atf wheels for 22 days between the 6th May and 15th July. The expenditure on the station was as follows:—

	1 12
Establishment and maintenance charged to Regular Budget	450
Working pumps charged to Low Nile Credit	725
Working pumps charged to Low Nile Credit Contribution from Kom El Akhdar Estate towards working	
of pumps	176
	T1
Total I	E. 1,351

#### WINTER AND SPRING ROTATIONS.

The supply during the winter was ample for all demands. A good deal of attention has latterly been paid to the important subject of regulation at all seasons, with the object of producing levels for limited periods sufficient for flow irrigation wherever that may be possible. This is a boon much appreciated by the cultivators as the saving thereby affected in cost of fuel and wenr of cattle is very great. An adequate provision of regulators is of course the first requisite towards making the system general. Thanks to the funds granted by the Caisse de la Dette for irrigation improvements, a good many regulators have been built during the past few years. This system of scientific and systematic regulation is most advanced in the 2nd Circle in which tables indicating the periods of high and low supply and the levels above and below regulators to be worked to, have been drawn up.

During the winter and spring 4 days of high, followed by 12 to 16 days, according to the time of year, of low supply is given. The Inspector of Irrigation 2nd Circle notes that it was found possible, during the past year, to continue this system up to the middle of April after which the general working of lift machines made it impossible to keep up levels. A month of unrestricted irrigation with low levels then followed till replaced by the usual summer rotations.

#### SUPPLY FROM ASWAN RESERVOIR.

It had been originally intended to indent on Aswan Reservoir for Lower Egypt as follows:—

						Cuble metres per day.
From	1st May	to	20th May	 	 • • •	 2,000,000
2+	21st ,,	10	25th ,,	 	 	 5,000,000
	26th	to	9th June	 	 	7,000,000
74		to	27th			10,000,000
39	20th ,,	10	7th July	 	 ***	 10,000,000

The early rise at Khartonin, however, rendered it possible to modify the programme so as to complete the emptying of the Reservoir at an earlier date, and the programme worked to was as follows:—

					Water drawn from Reservoir for Lower Egypt,
From 1st to 20th May	•••	•••	***	***	2,000,000 cubic metres per day. 7,000,000 9,000,000
4th June to 24th June	• • •	***		•••	15,000,000

The rise began to reach Aswan on the 17th June.

#### SUPPLY REACHING DELTA BARRAGES.

The Delta Barrages were tightly closed from the 10th April. The supply reaching them continued to diminish up till the 1st of June when the canals upstream of the barrages were drawing an aggregate discharge of 31,780,000 cubic metres per day. By the 8th June the discharge had increased to 36,220,000 cubic metres per day, under the influence of the discharge let go from the Aswan Reservoir on the 21st May. From the 10th June, or 16 days subsequent to the date that a discharge of 9 millions per day began to be sent down from the

Reservoir for Lower Egypt, the discharge above the barrages began to increase rapidly and had reached 41,440,000 cubic metres per day by the 15th June. The level of 15:50, the maximum level to which water is held up on the barrages without allowing any water to pass through them, was reached on the 3rd of July. The same level was not reached in 1900 till the 2nd of August, in 1901 till the 22nd July, and in 1898 and 1899, before the new weirs below the barrages began to work, till the 12th and 31st August respectively. Had it not been for the Aswan Reservoir, no improvement in the supply for the Delta could have been expected before the 2nd or 3rd of July, and then it would have been much slower than was the case with the reservoir to draw on.

The construction of the Barrage weirs had the effect of reducing the time of tension, as regards supply in the Delta, by from three weeks to a month. The effect of the Aswan Reservoir, combined with an early and satisfactory rise in the river, during the summer of 1903, was to reduce the time of tension by about another month, so that the period of very short supply was reduced to 38 days or from 1st May to the 8th June. In 1898, 1899 and 1900 the periods of tension or very short supply were 92 days, 70 days and 113 days respectively.

This reduction in the length of the period of tension, which increased in intensity the longer it grew, has been an enormous relief to the Irrigation staff, which has no longer to devote its entire energy for three months of the year to the question of distribution of water, much to the benefit of general administration.

#### DISTRIBUTION OF SUPPLY.

Following the practice of the previous year the discharge reaching the Delta Barrages was distributed as follows:—

1st Circle 43 °/<sub>0</sub> 2nd Circle 34 °/<sub>0</sub> 3rd Circle 23 °/<sub>0</sub>

The following table shows a few of the weekly discharges observed, and compares them with the correct discharges worked out in accordance with the above basis of distribution:—

	1st C	RCCE	281) C	lm:cr	ând Cincle		
DATE	Measured Discharge.	Correct Discharge	Measured Discharge,	Correct Disclorge.	Measured Discharge.	Correct Discharge.	
1st May 15th May 1st June 15th June	17,611,875 15,876,302 13,444,997 14,294,256 17,339,002 19,959,663	16,249,700 13,824,500 13,669,730 17,823,500	13,399,600 12,012,944 10,376,225 15,614,986	12,848,600 10,931,000 10,808,620 14,093,000	8.512,931 6,695,723 7,119,074 8,494,519	9,165,500 8,691,700 7,394,500 7,311,700 9,533,500 10,421,114	

The table shows that the 2nd Circle came off somewhat the best at the expense of the 3rd Circle. This was due to the fact that the discharges of the Rayah Mennfia gave steadily higher results for the same gauge readings than the discharge curve based on the previous years series of observed discharges.

#### SHARAKI DECREE.

The decree prohibiting the irrigation of fallow land until a date to be notified was issued on the 19th May 1903 to take effect from the 26th May 1903. The prohibition was removed on the 1st July when the level upstream of the Delta Barrage had almost reached 15.50.

#### SUMMER ROTATIONS.

Summer rotations commenced on the 15th May. They might with advantage have been commenced a fortnight earlier, as there was a considerable shortness of supply in some localities during this period.

The first table of rotations allowed for 6 days watering and 12 days stoppage for ordinary crops. For canals and sections of canals serving rice districts the rotation programme of the 1st Circle allowed for 4 days watering followed by 6 days stoppage, and those of the 2nd and 3rd Circles for 4 days watering followed by 5 days stoppage. The reason of the difference is that experience has shown that in the tangled system of long channels in the rice districts of Sharkia and Dakahlia it is impossible to get the rotations to work satisfactorily without the introduction of a day of general stoppage following the working turn of any section, so as to allow of the next section filling up throughout its length before the withdrawal of water commences. A notification was published in the "Official Journal" of 23rd March indicating the canals and sections of canals for which the rotation

programmes would be framed to allow of rice cultivation; a copy of this notification will be found in appendix D. The channels and sections of channels included in the notification practically allowed of rice cultivation over the whole area where it is ordinarily practised.

In appendix D will be found an interesting plan of the 1st Circle showing how the area was divided off into blocks for the purposes of rotations. The programme commenced by the stoppage of sections A, B, D, while C and E worked, after which came the turn of A and D and so on.

It was intended to apply the above programme for two complete rounds, i.e., from the 15th May to 19th June. It was, however, soon apparent that a programme allowing one watering in 18 days was too liberal. Taking the area given by the Ministry of Finance for the summer crop of 1902, and counting each acre under rice as equivalent to two acres under ordinary crop, we arrive at an area of ordinary crop of 1,446,000 feddans. Now on page 169 of last year's report, Sir Hanbury Brown showed that the amount of water required at the head of the Delta to give one watering to a feddan of ordinary summer crop was 555 cubic metres. If we accept the reasonable figure, given in "Egyptian Irrigation" (Willcocks), of 350 cubic metres as the actual umount of water required to give a watering to a feddan of summer crop, it follows that in the Delta 64 "/, of the head discharge on the average, is actually delivered on to the land. Compared with the results obtained in America and India, this is a very high percentage of which the apparent explanation is to be found in the small loss due to absorption, owing to a retentive soil, and probably still more to the efficient manner in which the fine Nile deposit puddles the irrigation channels throughout their length.

Now if each feddan requires 555 cubic metres and it be desired to give one watering in 18 days, the daily discharge required at the head of the Delta per feddan of ordinary crop becomes 555/18=30.8 cubic metres. The discharge then required in the river at the head of the Delta to have admitted of an 18-day rotation in 1902 would have been 1,446,000 × 30.8=44,536,800 cubic metres, and to have justified the adoption of an 18-day rotation in 1903; at least this amount of water should have been in sight during May and June. Now the discharge available on the 15th April, allowing for 2,500,000 cubic metres in the river below the Barrage, was only 41,448,000 and it was pretty certain to diminish till the 1st week in June, even with the aid of the reservoir water. Hence the decision to draw up the rotation programmes so as to allow of one watering in

18 days cannot be regarded as a prindent one and the results obtained indicate the necessity of proceeding with greater caution in the future.

On the 15th May the available supply had fallen to 36,500,000 c.m. per day and by the end of the month to 34,300,000 c.m. per day. Before the latter date it had become evident that an 18-day rotation was not workable. The crop returns since received show that we were dealing with an ordinary crop of 1,539,000 feddans instead of 1,446,000 feddans, the figure used in the above calculations, which did not improve matters.

Under the circumstances it was decided, on the completion of the 1st round, to stiffen the rotation by introducing 2 days of general stoppage between the 6-day periods of working which makes a rotation period of 24 days. In the rice districts of the 3rd Circle an extra day was added to the time of stoppage, making a rotation period of 10 days the same as that adopted by the 1st Circle in the original programme. The rotation periods for rice canals remained unaltered in the 1st and 2nd Circles. These programmes which, calculating as before, only required a river discharge of 35,397,000 c.m. was immediately effective. These days of general stoppage afford a means of compensating portions of sections which fail to get their full turn, and are most useful in preventing the collapse of the programme when dealing with a barely sufficient supply. As the supply increases and a little more water than required for one section becomes available, they can be omitted.

As noted above the supply began to increase rapidly from the 8th June, the discharge available on the 15th June being 44,900,000 c.m. and on the 23rd June 48,800,000 c.m. It was, therefore, found possible to gradually replace the 24 days rotation by others of much less severity. It appears that, had a start been made with two rounds of a 24-day rotation starting in the 1st of May, the conditions of supply would have been satisfied and the programme would have worked smoothly. As explained at the beginning of this chapter, the early summer supply was a very poor one, and in normal years, nuder existing conditions a 21-day rotation will probably be found to work satisfactorily.

The following table shows the nature of the rotations actually enforced, and the time each lasted;—

SUMMER ROTATIONS LOWER EGYPT 1903.

			N	ATURE OF	· Itotatio	N.		
			osals irrig ry eumner		On canals irrigating ordinary summer crops, etc.			
Circle.	Period of enforcement.	Number of days	Number of days	Proquency of Waterfugs,	Number of this switching.	Sumber of days	Possible frequency of water.	
1st 2nd 27 3rd 27 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	15th May to 1st June 2nd June to 25th June 26th June io 21st July 15th May to 1st June 2nd June to 25th June 26th June to 2nd July 15th May to 1st June 2nd June to 25th June 2nd June to 5th June 26th June to 5th July	6 6 6	12 18 8 12 18 12 12 16 8	18 24 18 18 24 18 24 18	4 - 4 - 4	5 - 5	10 	

Rotations were removed on the following dates:-

In the 1st Circle... On 4th July in Kalioubia Province and on 21st July in Sharkia and Dakahlia Provinces.

In the 2nd Circle... On the 3rd July. In the 3rd Circle... On the 5th July.

Results showed that it would have been better to maintain a mild rotation for another three weeks in the 2nd and 3rd Circles, as with the removal of the Sharaki Decree on the 1st July the demand, as usual, went up with a bound and notwithstanding the fact that the aggregate discharge of the canals on the 8th July had reached 71,000,000 c.m. per day, difficulties were experienced in getting water to the tail reaches well into July, and free flow levels were late in coming to sections of canals in which with a mild rotation they could easily have been induced at an earlier date. The moral is that rotations should be removed very gradually by gradually reducing the length of periods of stoppage. Mr. Dupuis, Inspector of the 2nd Circle, makes the following remarks in this connection:

"On the removal of restrictions all pumps and lifting machines worked their hardest irrigating Sharaki, with the result that canals running full flood supplies at their heads were pumped absolutely dry in their lower reaches, and hardly anywhere was the irrigation effected by free flow, many proprietors having to pay a heavy tax (generally P.T. 50 per feddan) to the pump-owners for the irrigation of their Sharaki lands. Had it been possible to stop all water lifting, it would have made practically no difference to the canal discharges, which would have irrigated the same area of land in the same time by free flow, and much useless expense would have been avoided. A mild rotation with overlapping turns would have met the case fairly well, as the smaller number of machines working would have been unable to keep down the canals, which would have risen and flowed on to the land through the outlets."

#### DUTY OF WATER.

The natural period on which to calculate the duty obtained from the available supply during the summer would appear to be that included between the dates of the commencement of summer rotations, and the removal of the Sharaki Decree. The imposition of rotations implies that supply no longer equals demand and that efforts are being made to extract the highest possible duty from the water. On the removal of the Sharaki Decree summer, flood, and winter irrigation becomes simultaneous and the calculation of a water duty becomes impossible. We thus arrive at the 46 days, included between the 15th May and the 30th June, as the period on which to work out the summer water duty for 1903.

The mean discharges of the main canals worked out as usual on the mean gauge readings for this period of 46 days were as follows:—

CANAL.	Mran W.L.	Corresponding discharge.
	11.1	e.m.
Rayyah Behera Rayyah Menufia Rayyah Tawliki Canal Ismailia Canal Sharkawia Canal Basusia	13.78 13.82 13.44 14.13 14.15 14.10	7,700,000 12,800,000 10,200,000 3,000,000 2,000,000 950,000
Total representing mean disc canal above the Delta Barrage be 30 June	harge withdrawn by tween 15th May and	36,650,000

The areas under summer crops in 1903 as furnished by the Ministry of Finance are as follows:—

Ciecle.	Summer Rice.	Cotton and Summer Crops other than rice.
	Feddans.	Feddans.
1st Circle	56,893 26,872 41,843	534,095 491,724 261,098
Total	125,608	1,286,917

The supply of water available for irrigation during the selected period of 46 days is as follows:—

Total discharge of 6 canals	36,650,000 2,500,000 816,000
Total   Deduct for Alexandria 45,000     Deduct for Port Said and Sucz 100,000	39,966,000
Available for Irrigation	39,821,000

Assuming, as done in last year's report, that rice takes double the amount of water that other summer crops do, the general duty is arrived at as follows:—

$$\frac{\text{Total available supply } 39.821,000}{125,608 \times 2 + 1,286,917} = \frac{39.821,000}{1,538,133} = 25.9 \text{ cm}.$$

a feddan of rice would thus require 51.8 cubic metres per day, and a feddan of other summer crops 25.9 cubic metres per day. Both the Inspectors of the 1st and 3rd Circles agree in considering the areas furnished by the Ministry or Finance as considerably below the mark, especially as regards the area under summer rice. The Inspector of Irrigation, 1st Circle, estimates the area under rice in his Circle at 78,270 feddans, against 56,893 feddans given in the statement supplied by the Ministry of Finance. With such uncertainty as to the correct areas under crop, figures for water duty must be accepted with the atmost reserve. On all sides in the northern Delta freshly reclaimed land under crop is to be seen, which leads to the belief that there must be a steady increase in the cropped area.

The following are the calculations for the summer water duty worked out for each Circle separately:—

#### DUTY OF WATER-1ST CIRCLE.

The areas	umler	crop	were:-	
-----------	-------	------	--------	--

			Feddans.
Summer rice	 	 -40	 56,893
Cotton and other summer crops			534,095

Doubling the rice area and adding the product to the area of other crops we get 647,881 feddans.

The mean summer discharges were:-

									Public metres per day.
Rayyah Tewfiki									10,200,000
Canal Ismailia				5 + 0					3,000,000
Canal Sharkawia								0.00	2,000,000
Canal Basusia								100	950,000
River pumps			5.01			***		***	500,000
						Total			16,650,000
Deduct for Port	Said	and	Suez			0 0 0	• • •		100,000
	Tota	al av	ailabl	e su	pply	***	***	4 = 4	16,550,000

The general duty is, therefore,  $\frac{16,550,000}{647,881} = 25^{\circ}5$  cubic metres.

#### DUTY OF WATER-2ND CIRCLE.

#### The areas under crop were:-

						Feibinna.
Summer rice	100 110		 		0.00	 26,872
4 h			 			
Cotton and other	Milling	croliv	 	0.00		 491,721

#### The available supply was:-

						per day.
Rayyah Menufia						12,800,000
River pumps				*** ***	***	1,500,000
River pamps Drawn from Meh	allet E	l Emir	Poul	***		666,000
			arge avni			14,966,000

Cubic metres

The general duty is, therefore,  $\frac{14,966,000}{26,872 \times 2 + 491,724} = 274$  cubic metres.

#### DUTY OF WATER-3RD CIRCLE.

The areas under crop were:—	Ferldam.
Cotton and other summer crops	41,843 261,098
The available supply was:—	Cuble metres per day.
Rayyuh Behera River pumps and Mehallet El Emir Pool	7,700,000
Deduct for Alexandria water supply	8,600,000 45,000
Total discharge available	8,555,000
The general duty is, therefore, $\frac{8,355,000}{41,843 \times 2 + 264,098} =$	24'8 cubic metre

#### The following table compares the above results:-

	(teneral duty	Hice duty		
Lower Egypt as a whole	25*9 25*5 27*40 24*80	51:50 51:00 51:80 19:60		

As noted before, the 3rd Circle got slightly less than its share (based on the crop figures of 1901) of the discharge at the Delta Barrage, but this fact only accounts for a portion of the difference in its general duty as compared with the other Circles, which is also largely due to the fact that its rice area has quadrapled since 1901, while the 1st and 2nd Circles only show increases of 80% and 90% in their rice areas when compared with the same year. The result is that the area used in calculating the general duty for 1903 in the 3rd Circle has increased by 25% as compared with 1901, while in the same time, the area used for calculating the general duty in the 1st and 2nd Circles have only increased by 7% and 4½% respectively. The proportions allotted to the several Circles will have to be recast in the light of the above facts.

The yield of the cotton crops will probably reach 6,500,000 kuntars. The arrivals at Alexandria up to the 31st May have been 6,276,283 kantars against 5,659,785 kuntars for the same date in 1902. The total

of the crop for 1902, which is taken as the arrivals reported up to the 31st August, was 5,838,790 kantars, so a further receipt of about 250,000 kantars before the 31st August 1904 may be expected, probably more as the cotton has been coming in faster than during the same period last year. The crop, therefore, has only been surpassed by the 1897 crop of 6,566,487 kantars. The area under cotton is given as follows:—

Upper Egypt Lower Egypt	 ***	4 4 4	***	 		• • •	•••	Feddans, 146,367 1,186,143
				Tota	al		£ 4 4	1,332,510

Assuming a crop of 6,500,000 kantars this gives a yield of 4.87 kantars per feddan. By comparing this yield with the figures in the table, on page 163 of last year's report, showing the estimated yields per feddau in Lower Egypt since 1894, it would appear that it is slightly over the average. Now in November it was generally stated that the yield was from 15 to 20%, below the average, the reason given being the low temperature which was obtained during the summer. A mild antumn with few fogs had, however, in some degree compensated for the want of summer heat. It is rare to hear of a favourable cotton season. Cold summers, foggy autumns and short water supply being in turn advanced as reasons for anticipating short yields, so no great reliance is to be placed on these rumours. However, the reports of short yield were so persistent last autumn that it seems reasonable to suppose that the yield was actually rather under than over the average and to look for the explanation of the almost bumper crop in increased area, and this is probably the correct explanation.

With rotations greatly relaxed before the end of June, and removed altogether early in July, it is impossible to say that the crop suffered from short supply. In fact some there are who assert that it suffered from a plethorn of water. Before the advent of the Delta Barrage weirs the period of greatest trial for the summer crops was from the middle of July to the middle of August. In the past year the water supply during this period was increstricted. Unfavourable climatic conditions may have affected the out turn, but, as noted above, nearly every crop is said to suffer from unfavourable climatic conditions.

Comparing the estimated outturn with the outturn of 6,369,911 kantars in 1901, a year of short supply and severe rotations, I think the conclusion to be deduced is that a relaxation of rotations and consequent

lower water duty is not likely to yield as good results as the maintenance of a fairly severe rotation, such as one with a 21-day period, and consequent greater economy of water resulting in larger areas.

Appendix E gives the statement of crop furnished by the Ministry of Finance.

Below are compared the areas under crop in 1902 and 1903:-

37100.00	WISTER CROPS.		SUMMER	CROPS.	NILI C	/1	
YEAR.	The Dolta. G	ilzeli.	The Delta	Glanh.	The lilta.	Glzeh.	GARDENS,
	2,067,039 13 2,054,977 13	1					11.235 12,348

As noted before, in the case of the rice crop, the areas are probably under-estimated. The early removal of the Sharaki Decree and the abundant supply in July gave the dhourra crop a chance it has not had for years, and the crop was a plentiful one.

The areas actually under cultivation are given as follows:-

YEAR.	The Dolla.	Gizeli.	Fotal.		
1902	3,070,789	180,986	3.251,775		
1903	3,069,214	172,100	3,241,314		

The difference exists in Gizeh Province in which the uncultivated area is now returned as 28,459 feddans against 14.753 feddans last year.

#### CHAPTER II.

#### FLOOD IRRIGATION.

As noted before, the early rise, which resulted in good summer levels at the Delta Barrage in June, was followed by a check and the flood was a late one, and very similar to those of 1900 and 1901. After the level of 15.50 was reached upstream of the Delta Barrage, the usual procedure of allowing the level downstream to rise 4 centi-

metres for each rise of 1 centimetre upstream was followed. The levels thus attained were as follows:—

DAT	.K								TEL DISTREAM OF SECTA BARRAGE
July 3r	d	T# 4		0=0	***	***	***	9 + 9	15.50
August	10th	127	0.0		***		499		15.50
41	15th								15.62 15.97
99	20th	***	***	49.0				***	16.43
**	3131								10+10

The Barrage was fully open by the end of August by which date the canals were all drawing their full flood supplies. The level upstream of the Barrage fluctuated between 16,20 and 16.50 during September, and rose again under the influence of the discharge from the Upper Egypt basins till it touched 16.93 on 25th October.

#### FLOOD ROTATIONS.

Flood rotations, which mean regulation so as to give alternate periods of high and low supply in each distributary, or each reach of the main and branch canals, commenced in August. These rotations vary slightly according to circumstances in each circle. In the 2nd Circle they commenced with alternate periods of high and low levels of 7 days each, and in October were modified so as to give 5 days of high and ten days of low levels. The advantages gained by these rotations are increase of flow irrigation and improvement of drainage.

#### REGULATION ON ZIFTA BARRAGE.

Zifta Barrage, which had been inaugurated in March, was regulated on throughout the summer, and yielded small supplies in the Rayah Abbas for short intervals, during the periods when the operations of rotations caused the level at its junction with the Bahr Shibin to fall sufficiently to create a draw through it. On the 7th July water began to reach Zifta from the Delta Barrage, which begins to pass forward water as soon as an upstream level of 15.50 is reached.

As the rise of the flood was slow, it was seen that some time must elapse before the Damietta branch would fill up sufficiently to feed the Rayah Abbas, without subjecting the new barrage to an excessive head, unless the small earthen sadd, which had been constructed below the latter at the beginning of the summer, were maintained. It was, therefore, decided only to pass such a discharge down the Damietta branch as the Rayah Abbas could dispose of, no water being allowed

to pass forward to wash away the small sadd referred to, till such time as it was possible to pass forward a supply heavy enough to fill the Damietta branch sufficiently to render the sadd unnecessary. This procedure was followed between the 3rd July and 14th August from which date the discharge reaching the Delta Barrages began to increase rapidly, and the river branches began to fill up. The Rayah Abbas began to draw a flood supply on the 14th July with a level up stream of the Barrage of 7.46. The maximum level reached before the down stream sadd disappeared, on 14th of August, was 8.60. The Barrage was fully open on the 30th August, when the upstream level reached 9.0. The maximum upstream level reached in September was 9.42, and in October 9.84. The Rayah Abbas continued to work up till the 15th October, from which date the supply coming down the Rayah Menufia was sufficient for the needs of Gharbia, and it was considered preferable to draw all the supply through the latter in order to maintain levels in it high, so as to afford as much flow irrigation as possible.

The discharge drawn by the Rayah Abbas from the 14th July to the end of August varied from  $7\frac{1}{2}$  to  $8\frac{1}{2}$  million cubic metres per day. The supply drawn by the Rayah Menufia from the 8th July up to the 15th August was almost constant at 25,000,000 c.m. per day. From the 15th August it began to increase till it reached its maximum of 33,761,000 c.m. on 22nd September. The level in the Rayah Abbas was reduced on the 1st September as the Rayah Menufia was then giving nearly all the supply required. The effect of the Zifta Barrage combined with the Rayah Abbas was, therefore, to increase the flood supply of the 2nd Circle by 30% during the latter half of July and Angust. This was a great boon rendering the early abandonment of rotations possible, and affording water for early sowings of dhourra and rice.

On the east of the river the new Mansuria Head was not completed. The old head began to draw water from the 19th July, but was closed again, owing to insufficient level between the 5th and 16th August. The Barrage was fully opened by the 31st August so the Mansuria canal, owing to the existence of the Zifta Barrage, drew a flood supply for 31 days during July and August.

The experience of the past season has, I think, shown that to obtain the full duty from the new burrage, a permanent weir is required down stream, so that the moment water is passed forward from the Delta Barrage it can be held up at Zifta to a level of 8.60 and passed into the canals on each bank. There is no navigation in the Damietta branch south of Cherbine during the summer, and a weir with automatic shutters designed to fall when a depth of say 50 centimetres was passing over them suggests itself. This would ensure a level downstream of the barrage when the shutters fell, sufficient to prevent an excessive head, while maintaining a sufficiently high level above the Barrage to serve the Munsuria canal and Rayah Abbas.

#### BASIN AND FLOOD IRRIGATION WEST GIZER.

Water entered the Girza head of the Lebeni canal on the 6th August, and Shabramant basin, through Abu Nimros escape, on 13th August. The Giza canal head at Kafr Almar began to draw on the 15th August, and the Zumr canal on 10th August. The level at Maarqab regulator reached 23.10 on 30th August and was held at that till 3rd October. The level at Tama regulator reached 22.20 on 29th August and was held at that till 5th October. The level at Dashur regulator reached 21.80 on 3rd September and was held at that till 8th October. Saqqara regulator was kept tight shut till the 4th September, when the level had reached 20.80. Shabramant Manshia and Iswid basins continued to draw water through Abu Nimros escape till 15th September, when the escape ceasing to draw was closed. Tamam Rai levels were reached on the following dates:—

BARIN			DATE OF REACHING T.B. LEVEL.
Maarqah	*** ***	*** *** ***	24th October.
Tama	***	*** *** ***	2nd November.
Dashur			30th October.
Shelman	***	*** *** ***	29th 15th
Manship	• • • • • • • • • • • • • • • • • • • •	*** ***	30th .,
[swid]	411	*** *** ***	8th November.
All hoshahs		Between	31st October and 10th November.

Water was drawn through Komi regulator between 22nd October and 8th November, when the heads of the Girza and Giza canals were closed, the basins brought up to T.R. levels and the hoshals along the Giza canal flooded. It will thus be seen that all the basins drew the great bulk of their water directly from the river, only a little topping up of basins being done with the sarf water from Beni Suef, a matter for congratulation.

#### BASIN AND FLOOD BRIGATION EAST GIZER.

Water entered Khashab canal on the 12th August and the Ghamaza head, which feeds the lower reaches of the same canal below Ghamaza regulator, on the 19th August. The Ghamaza regulator was kept tightly closed till the end of October, when it was opened to complete the filling of the lower basins. The Kafr Tarkhan and Hagir canals, which take off above Ghamaza regulator, began to work on the 18th August. On the 10th September Ghamaza escape, upstream of the regulator, was partially opened to create a draw through the upper basins. This draw was kept up till 10th of October, which was very satisfactory. The Ghamaza feeder worked till the end of October, when the regulator above it was opened. Turah feeder (Maasara basin) and Der-el-Tin escape (Basatcen basin) each drew in water for a few days in August. All the basins were filled in good time and kept at T.R. levels, or close to them, for from ten days to three weeks. The date on which T.R. levels was reached in each basin is given below.

BASIN DATE OF BRACHING T.R. LEVEL.

Tabeen ... ... 6th October

The improved section in the head reach of the Khashab canal proved of great service and east Gizch enjoyed better flood irrigation than it has done since the high flood of 1898. The only Sharaki area in the Province was a plot of 300 feddans in the Geziret El-Soul opposite Wasta.

#### SARF.

Nikla sadd was cut on the 9th November, a mouth earlier than in 1902, and the drainage of Iswid basin completed by the 17th idem. Girza head and Giza head, at Kafr El-Ahmar, were opened for drainage on 10th November, Abu Nimros escape was opened gradually from the 15th October. The sarl of the west Gizeh chain of basins was completed during the last week of November. The Giza canal hoshahs were all laid dry by the middle of November. On the east of the river Ghamaza escape was opened on the 4th November. Turah feeder was opened for drainage on 23rd October. Der-el-Tin escape was partially opened for "takhfif" on the 12th October and fully opened on the 3rd of November. The sarf of east Gizeh was completed by the 20th of November. No cuts in the banks were found necessary for sarf, the new escapes and feeder heads proving sufficient.

### FLOOD WATCHMEN.

The following statement shows the number of flood watchmen called out and the number of days spent by them on guard:—

Circle.	Number of men called out,	Number of days spent on guard.	Equivalent number of men for 100 days.
1st Circle 2nd Circle	 375 909 58 937	15 17 4 25	23 156 21 231
Total	 2279		415

The numbers of Corvée guardians employed in Lower Egypt during the past four years have been as follows:—

YEAR.					6		er of watchmen or 100 days.
1899	 	 	 ***	 	 		726
1900	 	 	 	 	 	• • •	3510
1901	4 * *	 	 * * *	 	 • • •		161
1902	 	 * * 0	 	 * * *	 ***		110

The floods of 1900, 1901 and 1903 were very similar.

The policy of reducing the number of flood watchmen called out has, I think, been overdone during the past few years, and the result is to be seen in the ragged condition of the river banks in many places which, deprived of the usual protection of "libsch," have suffered severely from wave action, and will require considerable expenditure to restore them. It would seem advisable in the future to call out a moderate number of men at the beginning of each flood to protect the banks exposed to wave action by facing them with "libsch." Once this is done, only a few patrols are required, unless the flood proves to be a high one, when more watchmen would have to be called out for a short time later on in the season. The only place on the river banks which gave any trouble was Hassan El Malik, in Markaz Ashmoun Menufia, on the Rosetta Branch. It is proposed to make a diversion here in 1904.

### NILE GAUGE OBSERVATIONS.

Marked rises commenced at Khartoum on the following dates:-

Öп	21st	May	with a	gauge reading	of	•••	 ***	0.14
On	Ist d	uly	77	22	***		 	1:54
On	31st	July	22	91			 	3:54

The above rises made themselves apparent at the Delta Barrage on the following dates:—

$\Omega_{\mathrm{B}}$	28th	June o	r afte	г		 	 	 38	days
		July	27		***	 	 ***	 24	91
On	13th	August						0.43	77

The maximum gauge reading recorded at Khurtoum was 6:30 on the 2nd September; the corresponding maximum levels occurred at Aswau on the 12th September or after 10 days, and the Delta Barrage on the 16th September or after 14 days. The maximum gauge recorded at Aswan was 16P-6K on 27th September which agrees exactly with the mean maximum. The maximum reading reached on the Rodah gauge was 22P-9K on 25th October, which gave a level of 16:93 upstream of the Barrage. The levels were due to the Upper Egypt Basin discharges, which came on a falling flood.

### LAKE VICTORIA NYANZA GAUGES.

A communication lately received from the Survey Department states that, owing to the gauges on lake Victoria Nyanza having been moved, the following corrections should be applied, 17 centimetres or 6".7 should be deducted from the readings of Kishmu gauge subsequent to August 1899, and 28 centimetres or 11" should be deducted from the readings of Jinja gauge subsequent to 21st December 1901. The Entebbé gauge was re-erected after an interval of 5 months in October 1901 at too high a level, but the amount of correction is not known. Hence the Entebbé gauge readings before and after 1901 cannot be compared.

Applying these corrections to the readings given on page 172 of last year's report and adding the readings for 1903 we arrive at the following statement:—

YEAR	Port Alice (Entebbé).	Parl Victoria Kisama.	Jiuja.
1st October, 1898	Ft. In.  3 2 2 6 1 7 3 5 5 9 5 10	Ft. In.  3 2½ 1 0°6 0 6·3 1 1·3 1 1·3 2 9·3	Ft. 1n.  3 1½ 1 5 1 0 1 5 1 4 3 4 3 9

The difference between the readings of the Kisumu and Jinja gauges for 1903 as compared with the years 1899-1901, seem to favour the idea that other unrecorded alterations have taken place. It is proposed in future to record the level on the Kisumu gauge, which is the only one which has a bench mark near it, and to take the reading of 31st December 1903 as 1.50 metres or 4.11".

The mean levels of the lake at the Kismun gauge as corrected since 1896 are given as follows:—

YKAR.										Mean level Isumu gauge.
1896										0°928 metres
1897			1 = 0				* * *			Incomplete
1898	***	- + 4	1 0 0	0.0.4				* * 1	1 * *	
1899										0.149
1900	4 4 4	4 4 4			4 + +					0.391
1901										
1902										
1903	* * *			* * *	0.0.0	0 00 0		* * *	1 0 0	11 (41)

#### CHAPTER III.

#### DRAINAGE

The maintenance of drains becomes daily of more importance. Many hundreds of kilometres of new drainage channels have been made in the Delta during the past seven years. In the annual report of 1898, page 147, will be found some remarks as to the expenditure required to keep the drainage channels in the Delta in fair working order. The estimate of the requirements at that time was L.E.33,000 and the kilometrage to be maintained has increased considerably since then. Now the total expenditure on maintenance of drains during 1903 only amounted to L.E.8174 or about 6% of the amount spent on the earthwork, exclusive of dredging in the maintenance of canals. The sum available for maintenance has been considerably reduced since that year, while the kilometrage of channels to be maintained has gone up by leaps and bounds.

Great efforts have been made of recent years to not only clear the beds of eanals but recast the sections, and make up the dilapidated banks, so as to render the channels capable of passing an ordinary flood supply. A large proportion of the cube of earthwork executed under the head of maintenance is due to this making up of banks. This is satisfactory in itself and the fact that it can be done is due to the greater results at present obtained for the same expenditure, owing to more and stricter supervision by reliable officers on contract work, than was the case some years ago. Meanwhile the drains suffer. As the more pressing cases of remodelling canal banks are dealt with, it is to be hoped that a larger proportion of the maintenance expenditure will be devoted to drains. It is also to be carnestly desired that the smus available for maintenance will gradually be increased. For every feddan of land reclaimed and brought under cultivation a corresponding increase to the budget should be made for the maintenance of the canals and drains serving the reclaimed area and rending it cultivable and contributory to the taxes. It must be remembered that, unless drainage is liberally provided for, reclaimed areas will relapse, and produce, and the returns from taxation fall off.

The weed growth in some of the drains gives much trouble and the latter will doubtless be a perennial one. The conditions under which a drainage channel works being peculiarly favourable to the production of such a growth. A steam weed cutter, which has given good results in England, is now being ordered for trial on the drains in the 1st Circle, which, it is to be hoped, may prove successful.

The question of rotations in drains was raised in last year's report and denounced. The Inspectors of the 1st and 3rd Circles have a good deal to say on the subject. Granted a perfect system of irrigation outlets and drainage inlets, cultivators who used their drains intelligently, and drains of suitable section, rotations would not be necessary and would be objectionable. Properly proportioned drainage inlets would force cultivators to close off their water supply when not required, and would discourage excessive flooding of land. In the absence of the above conditions over large areas, Inspectors will doubtless continue to be forced by circumstances to occasionally impose rotations on drains, to prevent swamping of land, as the lesser of two evils. The Inspector of the 3rd Circle writes as follows on the subject:

"In this province there are many low lying parts, and in large tracts there are net works of drains, and unless we had some control over them, it would mean excessive waste of water, high levels in drains resulting in damage to lands and higher levels in lake Mariotis with increased pumping at Mex. I know that proper outlets and rotations are the surest way of avoiding these evils, but the construction of outlets on a large scale means large expenditure, and the work can

only be done gradually with the funds available. Canal (high and low level) rotations are steadily enforced and are of great benefit in flood and winter; but they are not sufficient when the drains are so close to the canals and water courses, and we have found that in the peculiar circumstances in the province, the drain rotations are most beneficial, they keep drains low, and help to avoid waste and damage to lands. The main and branch drains are not sadded, only the private drains discharging into them; the rotations are made to fit in with the canal rotations and work excellently. One of the proofs of this is that the people now have a strong desire for these drain rotations, as they get better drainage for their low lands, and we have no complaints whatever".

After an absence of 4 years, I have lately inspected a considerable portion of the Behera Province. The improvement visible on all sides due to improved drainage is very marked. Large areas of what I remember, as marsh in the vicinity of Hosh Issa. Delingat, Damanhour and Rahmanieh, are now quite dry and rapidly coming under enlitivation. It is stated that some 25,000 feddars have recently been added to the cultivated area in the province; unfortunately there are no reliable returns to show progress. The deep cuvette out in the centre of Khairy drain has proved successful and kept a clear central channel with good velocity. Weed growth was noticeable in places, but the big drains in the first circle seem to suffer more in this respect.

### MEX PUMPING STATION.

The following statement shows the results obtained at Mex Pumping Station and compares them with those of the seven previous years:—

SEASON.	Quantity pumped.	Cint.	Rate per million cubic metres pumped.	Price of coal
	C.M	L.E.		3_15,
1895-1896 1896-1897 1897-1898 1898-1899 1899-1900 1900-1901 1901-1902 1902-1963	175,078,166 216,994,810 227,429,530 284,896,064 292,987,741 316,435,869 384,946,013 396,420,022	7,588 8,068 8,675 8,378 9,391 14,182 13,297 12,247	43.004 37.000 38.000 30.000 46.261 44.818 31.748 32.205	1.237 1.678 1.746 1.286 1.200

The quantity was a record, but was little in excess of the previous year. The rainfall of the season 1902-1903 was 11-27 ins., against 8:55 ins. in 1901-1902, so the small increase must be regarded as satisfactory. Pumping commenced on the 23rd September 1902 and stopped on the 30th April 1903. The price of coal was lower than it has been for five years, and the cost of pumping is the lowest since 1898-1899. The results of the first three seasons in the list cannot be compared with those which follow, as during them a large portion of the numping was paid for at contract rates which the price of fuel did not affect. The statement which follows shows details of rainfall and maximum and minimum levels of the lake for the past 8 years. It will be noticed that the maximum level has fallen considerably, while the minimum has risen, the difference between the maximum and minimum level for the past season being only 0.33 against 1:0 metre in 1895-1896 and 1899-1900. This result may be attributed to increase of summer irrigation, development of the drainage system for which the lake forms the outfall, and better regulation of flood and winter supplies in the canals. On Plate IV will be found a gauge diagram for the lake for a few selected years.

Shason.	Rainfall.	Maximum level of lake.	Thate of maximum level.	Minimum level of lake.	Onto of minimum level.
1895-1896 1896-1897 1897-1898 1898-1899 1899-1900 1900-1901 1901-1902 1902-1903	10:45 8:53 13:94 11:88 8:28 10:08 8:55 11:27	-215 -203 -217 -195 -229 -218 -231 -244	17th March, 7th January, 23rd January & 13th March, 18th Feb. 27th January, 19th January, 4th & 25th Jan, 23rd January,	-3·26 -3·29 -3·23	22nd Angust. 11th Sept. 27th August. 16th Sept. 11th August. 17th August. 16th August. 1th July.

The expenditure incurred during the year on working the pumping station was L.E.13,540. A sum of L.E.3770 was also spent on extra quarters for the staff, making the total expenditure for the year L.E.13,917,00

### CHAPTER IV.

# NEW WORKS OF IRRIGATION AND DRAINAGE AND WORKS CHARGED TO SUNDRY SPECIAL CREDITS.

The following statements show the Caisse Credits available for expenditure on special works during the year, the actual expenditure incurred and the balances to be carried forward:—

Caisse Chedits, 1903, by Circles.

Balance Allotment Foral, Mostlleet Expendi-	
from 1902. In 1903. Form. Months	Belative to entry forward.
T.E. M. T.E. M. T.E. M. F.M. M. H.M. M.	L.E M.
Let Circle.	
Irrigation Improvement .  10	23,120,054
Thunietta Sadd 366,485 - 366,485 366,485 366,48	
Special Law Nile	250(448)
Exhet #1 Borg 2.160.711 - 2.160.741 2,160.744 2,159.71	
Total 18,727 466 61.300 000 79.738 823 79.738 823 56.081 to	23.37 1.723
Total 15,727 166 61,300,000 79,758,823 79,738,823 56,381,10	2 1,31 (-12)
and escale,	
Irrigation Improvement: Prainage, Subsidiary Works 9.311270 64,000,000 73,941870 73,941870 40,959,31	32102.553
Prainage, Subsidiary Works 9.911.870 64.000,000 73.941.870 73.911.870 49.959.31 4aw Nile	
Low Phod 297,000 547,000 547,000 369.11	177,880
Total 9,911 870 65,0,7 0 m 75,258,870 74,863 118 41,671.85	33,131,544
1000	1
3rd Grde.	
transition improvement:	
Brainings	
Law Nile 2,100,000 2,100,000 725,992 725,60	s 0.341
Low Nile (Atf Pumps)	
Fig. 6. p. 100 of 1.	Stiff, tolum
Total 5936.514 55,000 000 62,906.511 64,262.566 50,024.45	11,211,002
Delta Barrage,	
Irrigation Improvement 1.617.787 6,000,000 [0,616,787 10,646,787 9,818,10	2 828,325
Low Nile 250,000 250,000 — —	_
Low Flood 1,500,803 747.20	753,679
Fotal   1.616 787   6.250 000   10,896,787   12,147,590   10,565 6	1,581,901
Zifta Barrage	
Subsidiary Works	0 847.441
Total 49.859.744 \$3,500,000 [03,359.734 [04,359,741 87,270,3	9 16,080,0m3
	-
Grand Tolals 88382.081 244.147.000 332.210.738 334.332.081 243.943.49	2 85, 118,580

### Caisse Chedits, 1903.

Relation   Relation							
Irrigation Improvements   19,985,882   17,713.788   5,885, 204 Gircle			allotment,	Total.	Modified.		Balance to carry forward,
Totals		L.E. M.	I., F. M.	LAME M.	L.E. M.	L.E. M.	L.E. M.
24   Circle   2,102,730   2,102,730   2,102,731   11,530,545   15,606, 21,102,731   11,530,545   15,606, 21,102,731   11,530,545   11	Irrigation Improvements.						
Totals			11,500,000				5,855,144
Delta Barrage	as A 252 A						6,723,662
Totals	75 7. 71						828,323
Liftle Barrage				86,576,107	80,376,107	33,×12.003	29,533,882
Life Barrage							
1,090,000							
Totals	n : em 1		1 /www.abchst	1.000.000	A AMMITANTA		4,000,000
Drainage		_				2,682,530	847.444
Left Circle	Tutals	_	7,500,000	7,500,000	7,500,000	2.682,559	1,817.111
Totals	Drainage.						
2nd Circle		3,801,055	25,000,000	28,801,055	28,801,055	21,553,954	7,247,104
Totals							16,855,842
Totals: Irrigation Improvements, Prairinge Subsidiary Works	Sel Cinda	871.181	51(000000	21,871.181	28,071,184	20,001.420	2,439,755
Metallet El Amir Said   Said	Totals	10,656,408	86,000,000	96,656,41%	199,KSR, 1115	73.318.747	26,542,661
Metallet El Amir Said   Said	Totala: Irrienthus Improve-						
Zifta Barrage   49,859.744   50,000,000   29,859.744   99,859.744   99,859.744   50,885   15,271   15,271   15,271   15,271   15,271   20,000,000   20,000,000   20,000,000   11,011,260   5,988	ments, Drainage Substillary						abre county that a
Zifta Barrage	Works	30,732,515	160,000,000	190,732,515	199,732,515	120/888/881	estrouties.
Zifta Barrage	The Benner						
Totals		10 970 711	70.0930 (NR)	00.829.744	1004 W TA 1 T 2 1	\$1.587.810	15,471,045
Totals		49,800,144					5,988,740
Mehallet El Amir Sadd		141 600 00 00 00		110 420 741	110	And Calle Avenue	91 900 605
Sadds   Damietta arrears   366,485   — 366,485   366,485   — 366,485   — 366,485   9,366,485   9,366,485   8,237,266   1,129	I offile	10,859,744	4 catalantana	1122/2017	110,500,411	264-16557142	21-m111/10/10
Sadds   Damietta arrears   366,485   — 366,485   366,485   — 366	M. hallet El Amir Sould		Dinidan	Fall Mark alous	Il towards wa	7 870 781	1,129.219
Totals 365,185 D,000,000 D,366,485 D,366,185 8,237,266 1,129  Special Low Nile Credit.  Int Circle 550,000 281,657 281,057 278,922 2 2nd Circle 550,000 800,000 344,548 343,129 1 3rd Circle (Atfoh) 4,662,593 250,000 22,000,000 725,992 725,648 0 3rd Circle (Atfoh) 4,662,593 4,000,000 8,391,250 6,011,790 5,458,969 255  Special Low Flowd Credit.  1st Circle 250,000 250,000 517,000 360,000 360,000 201,566 800,000 201,566 800,000 201,568 80	11 11 12	360,185	— — — — — — — — — — — — — — — — — — —				-
Special Low Nile Credit.	est a d					all samples dayling	1 100 0110
Let Circle	Totals	366,1%	alexur'enso	9,806,450	9,366,150	8,201,200	1,129.219
Let Circle	Surviul Law Vila Condit						
2nd Circle         —         S00,000         \$00,000         341,548         343,129         725,648         0           3rd Circle (Atfeh)         4,662,593         —         2,400,000         2,300,000         1,562,593         1,110,972         551           Totals         4,662,593         4,000,000         8,391,250         6,011,790         5,458,969         555           Special Law Flowl Coold         —         250,000         250,000         577,000         5,458,969         256           2nd Circle         —         297,000         517,000         360,000         200,568         360           3rd Circle         —         297,000         517,000         360,000         200,568         360           3rd Circle         —         297,000         517,000         360,000         200,568         360           3rd Circle         —         600,000         600,000         2,897,803         1,319,203         1,377           External         —         1,147,000         1,397,000         2,897,803         1,319,203         1,377           External         —         2,460,744         —         2,160,741         2,460,711         2,459,713,192         85,418	7 . (31 . 1		35/11/9/81	9×1 007	931 1257	278 1790	2,735
3rd Circle (Atfeb)       4,662,593		_					1,122
Totals							0,311
Totals	11				1,1012.590	1,110,348	551,620
Special Low Flowd Ordst.       250,000       <	100	4 10 10 10 10 10 10				* 4*.1 And	255.521
1st Circle     —     250,000     250,000     —     250,000       2nd Circle     —     297,000     517,000     517,000     369,111     177       3rd Circle     —     600,000     600,000     1,200,000     200,500     200,500     200,000       Barrage     —     1,147,000     1,397,000     2,897,803     1,319,003     1,577       Exbet of Borg Reservoir     2,460,744     —     2,160,744     2,460,741     2,459,744     1       Grand Totala     88,082,081     244,147     332,240,708     301,332,081     245,913,192     85,418	I DMIS	1,002,005	-1,121117(3)	8,321,231	15,112 1,7201	27, 6, 29, 2003	12-1-1-2
1st Circle     —     250,000     250,000     —     250,000       2nd Circle     —     297,000     517,000     517,000     369,111     177       3rd Circle     —     600,000     600,000     1,200,000     200,500     200,500     200,000       Barrage     —     1,147,000     1,397,000     2,897,803     1,319,003     1,577       Exbet of Borg Reservoir     2,460,744     —     2,160,744     2,460,741     2,459,744     1       Grand Totala     88,082,081     244,147     332,240,708     301,332,081     245,913,192     85,418	Special Lane Flowl Cordit.						
2nd Circle     —     297,000     517,000     369,100     369,111     177       3rd Circle     —     600,000     600,000     600,000     200,000     200,000     200,000     717,224     753       Totale     —     1,147,000     1,397,000     2,897,803     1,319,003     1,577       Exbet el Borg Reservoir     2,460,744     —     2,160,741     2,460,711     2,459,744     1       Grand Totala     88,082,081     244,147     332,240,708     301,332,081     245,913,192     85,418	1st Circle		25/10/10	250,000	250,000		27/20 EN WS
Barrage     —     —     1,500,803     747,294     753       Totals     —     1,147,000     1,397,000     2,897,803     1,319,203     1,377       Exbet el Borg Reservoir     2,460,744     —     2,160,741     2,400,711     2,459,744     1       Grand Totals     88,082,081     214,147     332,210,708     331,332,081     245,913,192     85,418	2nd Circle	1					155. NAME
Totals	D		600,000	45043,11616			3861.632 758,579
Ezbet el Borg Reservoir 2,460,744 — 2,160,741 2,460,711 2,459,744 1  Grand Totala 88,082,081 214,147 332,210,798 331,332,081 245,913,192 85,418			1 147 (84)	1.397.000			
Grand Totala 88,082,081 214,117 332,210,708 331,332,081 245,913,192 85,418					-, -, -, -, -,		
	Exhet el Borg Reservoir	2,460,744		2,160,741	2,160,711	2,459,744	1,0000
331,332,081	Grand Totals	\$8,082,081	214.117	332,210,738	301,332,081	245,918,192	85,418,589
						331.33	32,081
		1				1	

The total sum under the head of Caisse Credits available for expenditure during the year was L.E. 331,332 and the actual expenditure incurred was L.E. 245,913, leaving a balance of L.E. 85,419 to be carried forward. A large proportion of this balance is due for land taken up, as payments for land proceed slowly, only a small portion of land taken up in any year being paid for during the same year. In addition to the above sum of L.E.245,913,a sum of L.E.41,952 provided from the Ordinary Budget, including a sum of L.E.1,112 realized by the sale of old materials at the site of Zifta Barrage, was spent on Special works raising the total expenditure on the latter to L.E. 287,865.

This expenditure was divided between the Circles as follows:—

Claule.			Irrigation Improvements.	Drainage Works.	Sundry Special Works.	Total.
1st Circle 2nd Circle 3rd Circle Delta Barrage Zifta Barrage	• • •	000	38,188 35,546 14,492 12,747 89,831	25,812 26,732 27,091	3,105 713 12,911 747	67,055 62,991 54,494 13,494 89,831
Total	•••	***	190,804	79,635	17,476	287,865

### IRRIGATION IMPROVEMENTS-1ST CIRCLE.

The following statement gives the list of works carried out in the 1st Circle under the head of Irrigation Improvements and the expenditure incurred on each:—

Name of		Expenditure.				
					_ -	
ew Head Ismailia Canal				- • •		8,002
yriakos by wash						726
purs Rayyah Tewtiki and Bal	ir Moes					2,802
ctension of Um Galagil Cana	1	***				824
xtension of Ghazali Canal		***				1,253
irchase of materials for stock						1,600
apply and crection of Bounda	ry Stone	S				437
ew Regulators Sharkin and I	)akahlia					1.335
nil escape Kenneba Canal			4.00			246
appression of Bowlakia Canal						271
urchase of land areas 1902						445
loving work shop of Dredging		uv S				1,400
ifta Barrage Sudsidiary Wor	ks		***	***		14,632
stablishment and Surveys						4.215
				* * *	-	2.511
	T	otal				38,188

Of the above sum, L.E.31,725 was charged against Caisse Credits and L.E.6,463 against Ordinary Budget.

Ismailia Canal New Head.—This work was described at length in the last two reports. It has now been satisfactorily completed and was used for regulation during the past flood. Through navigation down the Ismailia and Suez Canals has thus been established throughout the year, and the power of regulating the discharges admitted to these canals placed under complete control. The total cost of the work has been L.E.31,141.

Syriakos By Wash. Ismailia Canal.—This work was built in 1902. The work done during the past year was completion of the channel and connecting up with the main canal; water can now be passed down the canal without opening the lock gates, a great improvement as regards regulation. The total expenditure has been L.E.9,758.

Spurs Rayyah Tewjiki and Bahr Moes.—Spurs have now been completed from kilometre 1 to kilometre 8, and from kilometre 26 to kilometre 28 in the Rayyah Tewfiki; 20 spurs have also been built in the Bahr Moes. Similar spurs have done a great deal for the Ibrahimieh Canal and Rayyah Menufia.

Extension of Om Galagil Canal.—This work was started last year and has now been completed; it includes 6 kilometres of new and 4 of remodelled channel. The canal serves an area of 15,000 feddans in Markazes Miniet Samanoud and Mansurah in Sharkia Province. The expenditure to date has been L.E.2,258. The final account has not yet been submitted.

Ghazali Canal Extension.—This is a small branch of the Bahr Faqus in the extreme north of Sharkia. It has been extended 9 kilometres to bring water within reach of the San-el-Hagar village, which previously had to depend on drainage water.

Purchase of Materials.—The surplus materials at Ismailia canal head were purchased for stock.

Regulators Sharkia and Dakahlia.—They included the following small masonry works:—

Head Shice Mahmoud Pasha Taher Canal.

- ., Bordein Canal.
- " Hafiz Pacha Canal.
- .. Morabia Canal.
- .. Sura Canal.

Regulator on Saarana Canal.

, Mostagadda Canal.

These are all most useful petty works bringing the supply of the above channels under control, thus improving irrigation and preventing flooding and waste of water.

Tail Escape Kenneha Canal.—This work replaces a sadd which was made and removed yearly.

Bulakia Canal Suppression.—This canal is being suppressed on smithing grounds. A credit was granted for this work in 1902 and a commencement made. No further credit was forthcoming till the end of 1903, so the work was not completed. It will be taken up again in 1904.

Moving Dredging Work Shops Shubra.—These shops occupied the right bank of the Isnailia Canal below the new head and lock and obstructed traffic. The fleet of dredgers also blocked the canal. The expenditure represents the sum paid to the Dredging Company for shifting the shops to the left bank of the canal on to the plot included between the new head and the diversion channel where there is no traffic to be interfered with. The diversion channel will serve as a basin for the dredgers and relieve the main channel, on which the navigation has greatly increased since the construction of the new lock.

Zifta Barrage Subsidiary Works.—The following statement enumerates the works carried out under this head which consist of the Zaglula and Mit Mohsen Feeder and the Om Salamah-Buhia junction channel with their contingent works:—

Name of work.	Expenditure.
Zaglula and Mit Mohsen junction channel	278
Head to Mit Mohsen junction channel	1,771
Right Gammbia Head on junction channel	494
Mit Mohsen Canal Head on	350
Om Salama Syphon ,,	2,425
Mansuria Syphon "	3,398
Light Railway Bridge Om Salama Canal	742
Making and removing Light Railway Bank	415
Om Salama Bulin junction channel	1,709
Regulators at Barautush where junction channel joins the	4,244
Buhia Canal  Head Sluice for Om Salamah Canal below off-take of new	'F, artri
	421
Head Sluice Sanafa Canal Branch of Om Salamah Mit	7-1
Molsen junction channel	158
Head Sluice Abid Canal, a branch of the same	217
Shonfas Drain syphon Om Salamah Buhia junction	379
Seven timber bridges	397
Cost of Stone	26(1
Marble gauges	38
	0.5.400
Total	17,699
Dedner paid in 1902	3,067
Expenditure in 1903	14,632

The Zagloula Mit Molisen Feeder takes off above Mit Ghamr Regulator and syphons under the Um Salamah and Mansuria Canals to feed the Zagloula Canal, which serves the land between the Mansuria Canal and the Nile. On this channel are built heads for a proposed new high level canal on east of the Mansuria, and the existing Gannabiah Mit Mohsen, also for the Sanafa and Abid Canals. The object of these works is to supply water from above Mit Ghamr Regulator to land south of Sannavta between the Nile and Buhin Canal. The head of this feeder consists of one vent of 3 metre span with regulating gate. The Om Salamah syphon consists of 3 pipes of 1.5 diameter, and the Mansuria syphon of 3 pipes of 1.02 diametre. The Light Railway was diverted from the right bank of the Mansuria Canal on to the right bank of the new feeder, being carried over the Om Salamah Canal by a girder bridge of 15 metre span. By this means a bridge over the new feeder, extensive alterations to the Um Salamah Head, and extension of the Mansuria syphon, were avoided. The Om Salamah Buhia junction. 4 kilometres in length, will feed the Buhia Canal with water taken in from the river at Zifta. The principal works in connection with it are the 2 regulators at its junction with the Buhia Canal, each consisting of 3 vents of 3 metre span. Below the off-take of the junction channel comes a head for the tail portion of the Om Salamah Canal, now considered a branch. The Shonfus Drain Syphon under the Om Salamah Buhia junction, and 7 timber bridges complete the list of works.

# IRRIGATION IMPROVEMENTS-2ND CIRCLE.

The following statement gives the works carried out under the head of Irrigation Improvements—2nd Circle.

			1	
NAME OF WORK.				Expenditure.
				L.E.
Remodelling Baguria and Sirsawia Heads				3,023
lemodelling Qoddaba and Bassinn Regula	itors			2,462
agail Canal Project	***			11,244
Remodelling and extending Radi Canal	•••			1,745
Salahib Canal	•••			3,230
Pipe syphous Mitherra Canal				1,174
temodelling and extending Telwana Cana				1,380
outlets on first 4 kilometres of Bahr Said	left bank	• • •		435
wo regulators on Masraf Babeel				663
etty Regulators in Gharbia				555
Remodelling Mithern Regulator				25()
legulating Doors for outlet heads				60
barkia Canal head				418
Jehalla Kebir Irrigation House				700
inproving upstream approaches Baguria	Lock			402
laps of Gharbin				300
Animy to Office Shibin El Kou				72
store houses and ghaffirs huts Nanaia and	Bagouria	Head		361
Som Ali Regulator Bahr Smilla	•••			202
Parchase of grooves, etc				132
tailing round Government land Kafr Za	ynt		• • • •	50
Cour small Regulators Menuha (arrears)				33
fail regulator Bahr Biela	• • • • • • •		• • •	116
Regulators in Menufia (arrears)	• • • • • • • • • • • • • • • • • • • •			159
Melie Canal	•••			880
'ombined Road and Railway Bridge Bas	sium	• • •		140
Brick burning for new works	•••	***	• • •	2,980
Supply of ironwork by Arsenul	• • • • • • •			1,000
Establishment			•••	726
	Total			35,546

Of the above total, L.E.16,027 was charged against Caisse Credits and L.E.19,519 against Ordinary Budget.

Raguria and Sirsawia Heads.—These were old-type works with imperfect regulation with vertical timbers. They have been repaired and remodelled, so that regulation may be effected by iron gates worked by a travelling winch.

Bassium and Qoddaba Regulators.—These important regulators on the Baguria and Qodaba Canals have also been modified so that regulation may be effected by means of gates and winches.

Nagail Canal Project.—Work on this project was started in 1901. It provides for the flood irrigation of a large area in Mennfia and already has proved of much value, obviating the necessity of heavy flood regulation in the Rayyah Mennfia and its upper branches. The expenditure to date has been L.E.24,477.

Remodelling and Extending Radi Canal.—This project will do for the high land on the cast of the Rayyah Mennfia what the Nagail Canal has done for the land on the west of it.

Salahib Canal.—This is a high level distributary along the Bahr Tirah below Salahib three kilometres in length.

Miterba Syphons.—These syphons were completed in 1902 in connection with the Mischerif Flood Canal; the total expenditure to date has been L.E.2,830.

Telicana Canal.—Is another important flood canal in Mennfia which has been remodelled and extended.

Melig Canal.—The old Ghuri Canal and West Ghannabiyah Melig have been joined up into one channel called the Melig Canal, which will serve during flood a large area between the Kassid Canal and Bahr Shibin.

The list also includes 10 small regulators, a few buildings and the provision of materials for projected works.

#### IRRIGATION IMPROVEMENTS-3RD CIRCLE.

The irrigation improvements in the 3rd Circle are given in the following statement:—

NAME OF WORK.	Expenditure.		
		_ -	L.F.
emodelling Baslaqun Canal	• • •		4,450
emodelling Edkawia Canal			852
emodelling Culverts on Mahmuda Canal			2,891
xtending Weirs Kafr Bulin Escape			560
emodelling Kafr Bulin Regulator			1,314
urvey			682
ayments for lands			730
est Houses Hosh Issa, Delingat und Rosetta			1,399
est House Damanhour and Maadia			203
urvey Nubaria Canal	* * *		450
upply Pipes for Baslaqun Canal			277
ixing Boundary Stones	0.9.0	***	140
delitions to Head of Khatatbah Flood Feeder	* * *		384
supply pipes for Kafr Bulin Regulator	0 0 0	***	160
Total			14,972
10tal			17,014

Of the above expenditure, L.E. 11,479 was charged against Caisse Credits and L.E. 3,013 against Ordinary Budget.

Remodelling Baslaque Canal.—The Baslaque Canal is an important branch of the Mahmudia; it has been entirely remodelled on a length of 13 kilometres and is now capable of irrigating 13,000 feddans:—

Remodelling Edkawia Canal.—This is also a branch of the Mahumdia; it has been remodelled on a length of 2 kilometres.

Remodelling Culverts Mahmudia Canal.—48 irrigation shices have been remodelled or replaced by new ones, and 16 sluices, found in excess of requirements, have been removed entirely. This is a most important improvement, affording greatly increased control over irrigation, and thus preventing waste of water and flooding of land.

Extending Weirs Kair Bulin Escape.—The diaphragm walls of these weirs have been lengthened so as to tic well into the banks.

The dry stone floors were also extended. These weirs have been quite successful in arresting the deterioration of the escape channel.

Remodelling Kafr Bulin Regulator.—It has long been recognized that a new regulator provided with gates was required to replace the tumble down structure at Kafr Bulin. A start was made with the collection of materials and other preliminaries.

The other items in the list call for no special remarks.

IRRIGATION IMPROVEMENTS .- DELTA BARRAGE DIRECTORATE.

The following is a statement of the irrigation improvements executed in the Delta Barrage Directorate:—

NAME OF WORK.	 Expenditure.		
Callection of materials for proposed Ward Completing Rayyah Behera Hend Completing Nikhla Regulator Rayyah Be Survey	lan Lock	000	 1,135 800 265 150 578 5,993 3,373 453
4.4444	Total		 12,747

Of the above expenditure, L.E. 9.818 was charged against Caisse Credits and L.E. 2,928 against Ordinary Budget.

Wardan Lock.—This work will be built in connection with the regulator at kilometre 21 of the Rayyah Behera, which canal will then be navigable throughout its length.

Khashab Canal.—The Khashab is the main flood canal of east Gizeli: its head reach was remodelled to a 10·0-metre bed on the first 5½ kilometres including a diversion of 2.8 kilometres. There was a marked improvement in the flood irrigation of east Gizeli consequent on this work, which will be continued in 1904.

Kafr Terkhan Canal.—This is a branch of the Khashab Canal. It was remodelled on a length of 10.8 kilometres.

### ZIFTA BARRAGE.

The expenditure in connection with Zifta Barrage and its subsidiary works was L.E. 89,831 distributed as follows:—

Zifia Barrage proper Rayyah Abbas and contingent	*** ***			21579
Mansuria Head	works	•••	• • •	39016 29235
				L.E. 89830

The total expenditure up to date under the same heads has been as follows:—

Zifta Barrage proper	•••	 	 287229
Rayyah Abbas and contingent Mansuria Head	WORKS		TISITI
	Total		

The Barrage and the Rayyah Abbas were practically completed at the end of 1902, and the inauguration ceremony took place on the 7th March 1903. The expenditure shown was mostly on accounts of arrears from the previous years. These works have been fully described in previous reports and the utilization of the Barrage during flood has been described in Chapter II.

The Mansuria Head on the east of the river to feed the Mansuria Canal was built during the year. It is similar to the Rayyah Abbas Head and consists of 4 vents of 5 metres each and a lock 35m>(8m with double gates. Some expenditure incurred on iron work and joining up with the canal and river will appear in the Accounts for 1904.

### DRAINAGE WORKS-1ST CHICLE.

Drainage Works.—The following is the detail of the expenditure on drainage works in the 1st Circle:—

NAME (	or Won	K.				EXPENDITURE
						L.E.
lemodelling Bahr El Bagar d	rain				 	9,457
emodelling Bahr Taweel	***				 	2,494
lemodelling Malsann Timsal	ı drain			0 0 0	 	7.046
lit El Amil drain					 	1,797
yphons under Suez Canal					 	1.496
xtension of Bilbeis drain					 	2,118
ost of land						1.000
ranch drain at Suez				***		46
onverting the old Snidia Hea	ad into	a sv	phon			358
			4		 	000
			Tot:	al.		25,812

Of the above expenditure, L.E. 21,554 was charged against Caisse Credits and L.E. 4,258 against Ordinary Budget.

Bahr-El-Bagar and Taweel Drains,—The Bahr-El-Bagar Drain is the outfall for the drainage of 295,000 feddans, and the Bahr Taweel the outfall for 470,000 feddans in Sharkia and Dakahlia. The total length of the Bahr-El-Bagar is 85 kilometres. Work was started in 1897. The whole length of the drain has been widened to bed-widths varying from 14 to 20 metres. The last 50 kilometres are now being deepened by dredging. The progress to date is 18 kilometres, of which 7 kilometres were done last year. The Bahr Taweel proper is only 7 kilometres in length after which it divides into two main branches, the Bahr Faqus and the Hadus Drains. The whole length was originally dredged to a 50.0-metre bed-width with a bed level at the tail of  $\overline{x}_0$  metre. The section of the channel is now being recast to a 40.0 metre bed width, the bed level at the tail being lowered to 30 metre. A length of 13 kilometre of the modified channel was completed during the year. A length of 2 kilometres of the main Bahr Faqus branch has also been remodelled during 1902 and 1903.

Mahsama Timsah Drain.—The work done during the year consisted in widening and deeping the first two kilometres of the drain; in replacing 3 pipe acqueducts by one syphon and a length of water course to facilitate dredging and obviate the necessity of lengthening the acqueducts; and in modifying existing acqueducts and bridges, so as to allow of the increase in the section of the drain. A new syphon of two pipes of 1.50 diametre each was built to carry the drain under the Suez Canal, the old syphon being too high.

Mit-el-Amel Drain.—This is an extension 6½ kilometres in length to serve the land between the Om Salama and Mansuria canals.

Syphons under the Suez Canal.—These syphons, two in number, are to dispose of drainage due to rainfall which banks up against the canal.

Extension of Bilbeis Drain.—The expenditure was incurred in paying off arrears for 1902 and in completing Abu Zabel syphon under the Ismailia Canal. Appendix F gives an interesting note by Mr. Molesworth on this work; an interesting example of the application of cement grouting.

Conversion of the Old Saidi Head into a syphon.—This is an old canal head under the Zagazig-Ismailia railway which it is proposed to convert into a drainage syphon by making bore holes in the floor, pumping out the sand from underneath, and replacing it by cement run in as grout. The floor thus thickened will then be cut down to the required level. So far as the work has gone it seems likely to prove successful.

#### DRAINAGE WORKS IN 2ND CIRCLE.

The following statement gives the detail of the expenditure on drainage works in the 2nd Circle:—

NAME OF WOL	ik.					Expenditure,
						LE.
Remodelling Bairn drain	• • •		•••	•••		2,189
Remodelling Samatay main drain	* • •					11,652
Remodelling Dahria drain	• • •	p + 0	•••		• • •	2.154
Remodelling Abshan drain	• • •		a o o	• • •		2,152
Remodelling Waziria drain		• • •		• • •	•••	3,526
Remodelling and extending Fun-Or	han o	lmin		• • •		1,404
Compensation for land and crops	8 * *	•••				468
Surveys	***				***	956
Establishment	•••	0 * 0		-01		2.231
		Tot	al	0 0 0	• • •	26,732

Of the above expenditure, L.E. 24,932 was charged against Caisse Credits and L.E. 1,800 against Ordinary Budget.

In the six drains enumerated a length of 83 kilometres of channel was remodelled. The heaviest job was the Samatay Drain, and the result of the work has been most satisfactory. The Inspector of Irrigation 2nd Circle points out how necessary it is to continue re-casting the sections of all the main drains in a similar manner.

#### DRAINAGE WORKS IN 3RD CIRCLE.

The following statement gives the detail of the expenditure on drainage works in the 3rd Circle:—

NAME OF WOR	EXPENDITURE				
emodelling Limum drain emodelling Damauhour drain emodelling Nediba drain emodelling Nediba drain emodelling and extending Nubaria onstructing Delingat drain extending Khairi drain onstructing Rozafa drain onstructing Kafr Melit drain oustructing Mehallet Bishr drain oustructing Mehallet Bishr drain orombay drain syphon establishment and Survey esyments for land	drain				3,940 1,808 1,813 1,775 5,410 3,016 1,536 1,495 560 804 244 2,650 2,040
		Tota	il	 	27,091

Of the above expenditure, L.E. 25,631 was charged against Special Coisse Credits, and L.E. 1,460 against Ordinary Budget.

The Umum Drain.—The channel was remodelled on a length of 6 kilometres up to its junction with the Damanhour Drain.

The Damanhour Drain.—The channel was remodelled on a length of 5 kilometres from its junction with the Umum Drain.

The Nediba Drain.—The channel was remodelled throughout its entire length of 10.2 kilometres.

The Nubaria Drain.—The remodelling of the south branch was completed and a small branch 1.2 kilometres in length constructed joining in at the syphon under the Hagar Canal.

The Khairi Drain.—The main drain was extended 5.4 kilometres from the Gabares Drain junction in a south-westerly direction. The central channel was also widened and deepened in its upper reach.

Delingat and Rozaja Drains.—These are important branches of the Khairi Drain 12 kilometres and 4.1 kilometres in length.

The Kafr Beni Hilal Syphon carries the drain of the same name under the Damanhour Dessnq railway line.

Kajr Melit Drain.—This drain starts on the north of the Mahmudia Canal opposite kilometre one and joins the Edku Drain at the crossing of the old Fransiwiyah Canal.

The Sorombay syphon carries the drain of the same name under

the Shaker canal.

Mehallet Bisher Drain.—This drain runs on the left boundary of the Sahel Markaz Canal to join the Miniet Salamah Drain.

The following statements show the lengths of new channels and existing channels remodelled under the heads of "Irrigation Improvements" and "Drainage Works," together with the cubes of earthwork by hand and dredging executed under each head and the cost of the same.

IRRIGATION IMPROVEMENTS.

	ned refress.	emodulled channel flometres.	FARTHWOR	E BY HAND.	Dann	aisa.	Total cost Enrithwo: k
CIRCLE	New channel kilonectes	Remodelles channel kilonetres	Cube,	Cost.	Cube.	Cent.	and Dredging.
			С.М.	L.E.	47,34,	L.E.	14.12
1st 2nd	19.0	4.0	229,678 792,626	3 789 12 693	_	_	3 789 12 693
3rd Delia Barrage	2.8	15·0 13·5	246,895 495,124	4 883 7 325	_ _ _	_	4 883 7 325
							202 1990
Totals	35-5	91.8	1,764,323	28 690			28 690

### DRAINAGE WORKS.

	New minel	channel channel kilometres.	Easthwori	RYHAND.	BYHAND. DREDGING,		
Circle.	New channel kilometres	Itemedelled channel kilometred	Cube.	Cost.	Cube.	Cost.	Dredging.
			С.М.	L.E.	C.M.	L.E.	L.E.
1st 2ml 3rd	6·5 4·0 37·1	10.5 83.0 26.0	92,369 1,216,676 934,809	1 314 12 693 16 026	355,708 24,829	13,679(°) 814 —	14 993 13 537 16 026
Totals	47.6	119.5	2,243,854	30 (33	380,537	14,523	44 556

<sup>(1)</sup> Includes L.E. 265 paid for work by the day at Aba Zabel Syphon; L.E. 425 work by day at Syriacos By wash; L.E. 265 paid on account for Masama Timsah Drain;

### EXPENDITURE ON SUNDRY CREDITS.

The following statement shows the expenditure on sundry credits which appear in Appendix A:—

Cincin	Name of Credit.	Amount.	How SPENT
2nd Circle	Low Nile Damicuta Sadd Ez. El Borg R. Low Nile Low Flood . Mehallet El Annir Sadd . Low Nile Low Flood . Low Flood	1.E. 279 366 2,460 344 369 7,871 4,836 204 747 17,476	Payments for land taken for sadd in 1902 Arrears for 1902. Working Rotations. Irrigation of river sahels. Construction of sadd.

The only item in the above which calls for remark is the expenditure of L.E. 4,836 against the Low Nile Credit in the 3rd Circle. Of this a sum of L.E. 4,111 was spent in roofing the engine and boiler houses of Atf Pumping Station and the purchase of three new boilers and replacing some gearing.

AGRICULTURAL ROADS.

The annual progress statement is given below:—

Cincle and Province	Existing at end of 1992,	Added during 1900,	Total at end of 1903.	Expenditure, 1903,
1st Circle.	Kilom,	Kilom.	Kilom.	L.E.
Galiubia	107 2021	_	107 2023	_
Dakahlia	2031	_	2035	_
2nd Circle.	>=4		200	
Menufia	279 767	38	279 805	12,272 (*)
Srd Circle.				
Behera	2811		2811	
Total	1,810}	38	1,8781	12,272

<sup>(\*)</sup> L.E. 2.957 arrears for land. 2.685 Dessuq Kobri Osman Road not completed and so not included in the statement.

# BRIDGES TO REPLACE FERRIES.

The following expenditure was incurred under the above head:-

		L. K.
1st Circle-Bridge on Bulia Canal at Tonkh El Akla	111	100
3rd Circle-Completing Swing Bridge on Khatathah	Canal	1,620
of the chere only can a series		
Tot	nt lak	6. 1,720
	_	

# EXPENDITURE ON BEHALF OF COMPANIES OR OTHER ADMINISTRATIONS.

The following statement gives the contributions made by Companies or other Administrations and expended on special works and the names of the said works:—

Circle	Object for which contribution was made.	Amount of contribu- tion.	Expendi-
		L.E.	1
2nd Circle	Cost of Mohit-Shamarka Canal Head, sluice and tail escape, contributed by Administra-		*****
	tion of Domains	340	340
۰ ۰ ۰	Remodelling Yusef Eff. Canal, contributed by Société Agricole	4()()	400
3rd Circle	Maintaining Bridges on Mahmudia Canal, contributed by Municipality of Alexandria.	221	221
77 • •	Working Arf Pumps for the benefit of Kom El Akdar escape, contributed by the Com-	170	176
99 0 0	Contribution towards cost of Rusetta Rest House by Ministry of Interior	60	61
Delta Barrage .	Construction of Canal and Head Sluice for Wardan Estate Company	5,000	4,631
49	Making a bank along the Bahr El Anna, contributed by Ministry of Finance	838	838
		-	
	Total	7,035	6,666
			-

Most of the items in the above list call for no remark. The Wardam Estate Company have obtained the concession of a large tract of low-lying desert land on the west of the Rayyah Behera on which it is proposed to start arboriculture. A flood canal to serve the estate, 6.4 kilometres in length, was made with a head shrice of three-metre vents.

Bahr El Aama bank.—At the request of the Ministry of Finance the right bank of the Bahr El Aama was moved forward on a length of 1.4 kilometres, so as to bring a large strip of sahel inside it, which will fetch a high price for building sites and gardens.

### CHAPITER V.

#### MAINTENANCE AND REPAIRS.

The following statement shows the total expenditure under the head of maintenance and repairs:—

	Expendeture.				
C1 RCLE.	Regular Budger.	Corvée abulition.	Sundry Receipts.	Total.	
1st Circle	40,765 33,233 20,751 16,566	46,000 42,000 26,350 7,650	251 792 1,339 1,132	236,829	

The above expenditure was distributed as follows: -

HEAD OF EXPENDITURE	let Circle	and Circle.	3rd Circle.	Delta Barrage.	Total.
EN. 119 (2 NY	L.E.	11.	L.E.	1	L.n.
Flood Protective Works Repairs of Structures and general	8.080	10,702	6,847	5,093	30,722
Maintenance Maintaining Roads	6,544	7,50G 557	8,077 500	9,857	31,984 2,457
Maintenance of Canals and Drains	70,992	57,260	33,016	10,398	171,666
Totals	87,016	76,025	48,440	25,348	236,829

FLOOD PROTECTIVE WORKS.

The expenditure was distributed as follows:-

HEAD OF EXPENDITURE	lat Circle.	Ind Circle.	3rd Circle.	Delta Barrage.	Total.
	L.E.	L.E.	L.E.	L.E.	l., H.
Purchase of Stone and Building	5,591	10,501	6,487	4,520	27,099
Sundry Materials	_	7()	360	245	675
Earthwork	2,489	1,778	911	328	5,506
					011 2 1/1
Totals	8,080	12,349	7,758	5,093	33,280
Deduct charged to Corvée Relief	_	1,647	911	-	2,558
Balance	8,080	10,702	6,817	5,093	30,722

The detail of the work done in the 1st and 3rd Circles and the Delta Barrage Directorate is as follows:—

CHECLE	New Spura.	Spurs regulred.	New Bevelment.	Revetment repaired.
	No.	No.	L.M.	t., M.
1st Circle	4	116	2,512	4,225
3rd Circle	14	88	832	1,688
Delta Barrage	2	28	5,412	2,338
Totals	20	270	8,756	8,251

The details for the 2nd Circle have not been supplied.

The cube of carthwork executed was 347,777 cubic metres. The expenditure was about the same as last year. What is required to make the river banks secure is the steady execution of retirements. A sum of at least L.E.30,000 per annum should be devoted to this work annually for some years in addition to the present annual expenditure of about L.E.30,000. The present allotments for Nile Defence Works only permit of maintaining the existing spurs and revenuents and small extensions of the same.

Retirements on the scale required cannot be faced. Needless to say this is the most argently required work in the Delta seeing what the consequences of a breach in the banks would be.

### GENERAL MAINTENANCE.

The most important works executed under this head were as follows:—

In the 2nd Circle. Stone work below canal regulators	L.E.1,000
In the 3rd Circle. Maintaining Abukir sea wall	,, 3,181
In Delia Barrage. Directorate. Maintenance of gardens.	,, 1,814
" Maintaining and working Barrage	,, 6,867

The policy of using big blocks of stone for the repairs of Abukir sea wall has proved most successful and the condition of the work is now better than it has been for many years. In fact a large portion of the best consignment of stone is held in reserve, there being no necessity to use it at present.

### MAINTENANCE OF ROADS.

As often remarked before, the sum expended on roads maintenance is much too small. An expenditure of L.E.2,457 on the maintenance of 1840 kilometres of roads is ridiculous; about three times this amount would be the minimum with which one could even pretend to maintain the roads.

# MAINTENANCE OF CANALS AND DRAINS.

The following statement shows the cubes of earthwork by hand and the dredging executed in the maintenance of canals and drains during the year with the expenditure incurred:—

0	EARTHWORK BY		C BY HAND	BY HAND DREDGING		Weed	
Cincie		Cube.	Payments in 1903.	Cule.	l'ayments in 1903.	clearance.	Total.
		C.M.	L.E.	С.М.	L.E.	L.E.	L.E.
1st Circle 2nd Circle 3rd Circle Delta Barrage	•••	2,290,617 3,272,984 1,015,435 671,000	51.190 54,791 23,355 10,398	680,045 28,411 278,232	17,148(°) 966 9,460	2,429	70,767 55,757 32,815 10,398
Totals	•••	7,250,036	139.734	986,688	27.574	2.199	169,737

<sup>(\*)</sup> A cube of 182,470 out of this was paid for in 1902. A large proportion of the cube of carthwork was done in remodelling canal banks. In the 1st Circle 65 kilometres of banks were remodelled and the other circles were doing as much or more. The Inspector of the 2nd Circle states that several hundred kilometres of canal channels have been remodelled during the past few years.

The cube executed and expenditure incurred in maintenance of drains included in the above statement were as follows:—

Clectie	EARTHWORD	EARTHWORK BY RAND		DREDGING		
	Cube.	Cost.	Cube.	Cost.	elearance.	Total.
	С.М.	L,E.	C.M.	L.E.	L.E.	L.E.
1st Circle	77,811	5,910 1,420 1,390	14,7(%)	500	954	6,86 <u>4</u> 1,920 1,390
Totals	500,061	8,720	14,706	500	954	10,174

The above is a very small proportion of the total expenditure on earthwork. The Inspector of 2nd Circle explains that the early arrival of high levels in the canals put a stop to the work on drains which was in progress.

The following is the 5 years statement of dredging executed in maintenance of Canuls and Drains.

Five years' statement of quantities of dredging done in maintenance:-

CANALS AND DRAINS.	1893-1899	1899-1900	1900-1901	1901-1902	1902-1903
	C, M,	C. M.	C. M.	C.M.	C.M.
IST CINCLE  Ismailia Canal	322,471 125,557 152,854 51,412 2,823 22,618	225,096 77,462 195,969 62,501 70,197 15,000	190,799 82,647 229,885 84,622 32,115 21,137	152,006 101,648 246,157 70,886 31,818 14,624 20,001 5,410	302,776 72,977 107,205 64,905 — 182,184
Total	677,765	646,228	641,155	654,570	650,045*
Rayyah Menufin Qustil Canul Bahr Tirah. Qoldaba Lock Baguria Head Kafr Rabea Lock Muhit Drain	399,937 74,810 10,530	255,535 133,294 5,969 5,512 4,424	112,567 	131,176 — — 4,014 5,965	13,703
Total	188,277	400,031	128,310	111,156	25,411
Bayyah Behera and Khaiatbah Canal	185,982 123,434 37,980	136,516 117,530 17,813	149,915 159,921	82,263 142,027	111,837 160,395
Total	347,396	271.889	309,884	224,293	278,232
Grand Totals	1,310,435	1,327,751	1,079,601	1,020,019	986,688
Expenditure L.E	-	770	-	_	27,574

<sup>&</sup>quot; Of this 182,470 was paid for provious to 1900.

In the 1st Circle the bed levels of the Ismailia, Sharkawia, Bassussia and Kumbatia Canals were raised 0.40, on account of the higher levels now maintained above the Delta Barrage. This accounts for the decrease in dredging in the last three channels. A large cube was done in the Ismailia and Suez Canals in the interests of navigation.

Dredging has almost ceased in the 2nd Circle, a fact which the Inspector ascribes to recasting of sections of canals, using regulators sparingly in flood, the spurring of canals, and the abolition of double sources of supply to wit: the Bir Shams Feeder to the Rayyah Menufia.

### CHAPTER VI.

### THE WADI TUMILAT ESTATE.

The progress made by this estate continues to be most satisfactory. The following statement shows the capital expenditure during the year, and compares the original estimate of capital expenditure required with the actual expenditure up to date:—

		Expen	Expenditure.		
HEADS OF EXPENDITURE	Original Estimale.	During 1903.	Total to end of 1903.		
	LE	L.E.	LE.		
Drainage and Reclamation Works.					
Enlargement of pumping station	6,000	_	4,279		
Enlargement of main drain	17,000	-	14,676		
Branch and field drains and field channels	15,189	290	8,215		
Remodelling Irrigation Systems.					
Wooden bridges and pipe heads	-	50			
Purchase of Plant.	10,000	50	8,767		
Barge for pump dredger	_	119			
Stay and Farm Buildings.	2,500	119	3,024		
New Ezbels	8,500	97	2,877		
Steam Ploughing, Staff and Sundries.					
Pay of staff, travelling allowance and sundries Ploughing.	_	368 108			
	3,000	476	3,461		
Totals L.E.	62,189	1,032	45,299		

The total capital expenditure during the year was L.E.1,032, and the capital expenditure up to the end of the year L.E.45,299. A small amount of drainage work still remains to be done on the west of the Ismailia Canal; this cannot be carried out till the old Saidia Head under the Ismailia Railway has been converted into a syphon.

It will not be necessary to borrow any more money for the completion of the works since, as will be shown below, the surplus of revenue over expenditure is considerable.

### REVENUE ACCOUNT.

The receipts and the expenditure during the year are as follows:-

RECEIPTS:—				
				L.F.
Balance brought forward from 1	902			1,708
Rent of land (16,922) feddaus				27,514
., ., Palm trees				406
" " Water mills				152
,, ,, Incubator				20
Grazing and Wild Same	r			185
Sundries				168
	Total	•••	• • •	L.E.30,153
EXPENDITURE:—				
				1.E.
	***	• • •	• • •	2,340
Kassassim pumps		• • •		3,684
Payment to Public Instruction	***			8,000
Taxes	•••	***		5.875
Maintenance of canals and drain		• • •		1,675
Petty expenses and travelling a	Howances			28)
Measures for prevention of catt	le plugue	• • •	• • •	
	Total		•••	L.E.21,796
	Surpl	นร		I.E.8,357

Deducting the balance carried forward, the net profit on the year's working was L.E.6,649.

Comparison of Estimated and Actual Receipts.

The following state	ment compares	the estimated an	l actual receipts:—
---------------------	---------------	------------------	---------------------

YEAR OF NEW	MANAGEMENT.	Expenditure.	Receipts.	Surplus,	Deficit,
		L.E.	L. F.	L.F.	Lillia
Original forecast	$\begin{array}{c} \begin{array}{c} \text{1st} \dots \\ \text{2nd} \dots \\ \text{3rd} \dots \\ \text{4tn} \dots \\ \text{5th} \dots \end{array}$	19.350	15,710 17,200 19,700 22,500 23,750	350 3,150 4,400	3,640
Actual results	$ \begin{array}{c} 1899 \dots \\ 1900 \dots \\ 1901 \dots \\ 1902 \dots \\ 1903 \dots \dots \end{array} $	15,827 19,648 20,418 21,151 21,796	16,025 19,957 21,138 22,744 28,445	198 314 720 1,593 6,649	- - - -

Hence it appears that the net surplus on the five years of working is L.E.9,474 against the estimate of 1.E.2.110.

The growth of expenditure is due to increase of area and consequent increase in the maintenance of irrigation and drainage channels.

The area rented during 1903 was 16,922 feddans. The forecast for the year was 12,000 feddans. Hence it appears that the estate is developing at a satisfactory rate. Of the 16,922 feddans rented there remain 2,655 feddans still michtivated.

CROPS.

The areas under the various crops were as follows:-

										Feddans.
Cotton.										4,731
Maize Rice			- • •							3,580
Samar	***	0 * 0		* * *	* * *		* * *			2,182
Sesame				* * *			***			3,190
Ground r	ute	* * *			4 0 0	0.00	***	* * •	+ = =	310
Vegetable	(Page 1 1 1 1	***		•••	110			* * *	***	224 5()
2,			***			* * *	***	* * *		14,267
Uncultiva	ntand.									
	1237 14	***	***	1 = 0	* * *	444	* * *	4 = +	* * *	2.655
										16,920
										V Odv. m.m.

The rent collected works out to about 30 % of the value of the crops.

# KASSASSIN PUMPING STATION.

Tables have now been made out by Mr. Brooke for calculating the discharge of the pumps from the revolutions and lift.

The following statement gives details of the working of the Station for the last three years:—

			Quantity	Consumpti	ON & COS	T OF COAL			
YEAR	Aren rented fedd.	Quantity pumped	pumped per feddan.	Coal consumed.	Cost of Cont.	Coal constant per million c.m. lifted.	talit.	Expenditure for the year.	
				Tons.	L.E.	Tons.	Metres.	IW.	
1901	12,367	60,660,000	4.917	1,753	3,099	29	2455 to 3460	3,961	
1902	15,200	76,550,000	5,036	2,001	3.240	26	255 to 301	4,234	
1903	16,922	89,548,000	5,292	2,099	2,004	235	2.45 to 2.77	3,684	

Mr. Langley explains the increase of cube pumped per feddan as being due to the increase in area of land under reclamation consuming large quantities of water, as compared with old cultivated land consuming much less water. The satisfactory reduction in the consumption of coal is doubtless due to the reduction in lift consequent on the improvement in the outfall drain.

After being warded off for a long time by strict precautions the cattle plague finally appeared on the estate, and up to the end of February had carried off 410 head of cattle. All possible precautious are being taken.

The following is the estimate of receipts and expenditure for 1904:-

RECEIPTS:-								K.L.
Rent of land (17,000 feddans)	)							30,000
" Palm trees				• • •	•••		***	$\frac{400}{150}$
77		0 0 0		•••				20
,,				•••			• • •	100
**				* * *		* * *	9 9 9	130
Sumfries						***	***	190
							LE	.30,800
Expenditure.—							-	I.E.
	•••							2,841
			1 = 0			* * *		$\frac{3.800}{5,916}$
	***	***		* * *		* * *		8,000
Payment to Public Instruction			• • •	* * *		* * *		2,000
Maintenance of canals and a	irmuns							200
Petty expenses	• • • • • • • • • • • • • • • • • • • •	•••				* * *		
		Esti	mate	d St	irpli	18	<u>.</u>	22,757 8,043 2,30,800

Mr. Langley and Monssa Bey Ghalib are to be congratulated on a successful year's working.

### CONCLUSION.

#### STAFF.

Sir Hanbury Brown retired from the post of Inspector General, Lower Egypt, on 10th April and was succeeded by me.

The circles were held as before. Mr. Tottenham acted as Inspector of the 2nd Circle for a considerable portion of the year, while Mr. Dupuis was absent on missions and leave.

Mr. Molesworth, Director of Works, was transferred from the 1st to 2nd Circle in December.

Mr. Hurley replaced Mr. Molesworth, his mission as Resident Engineer on Zifta Barrage having terminated on completion of the work.

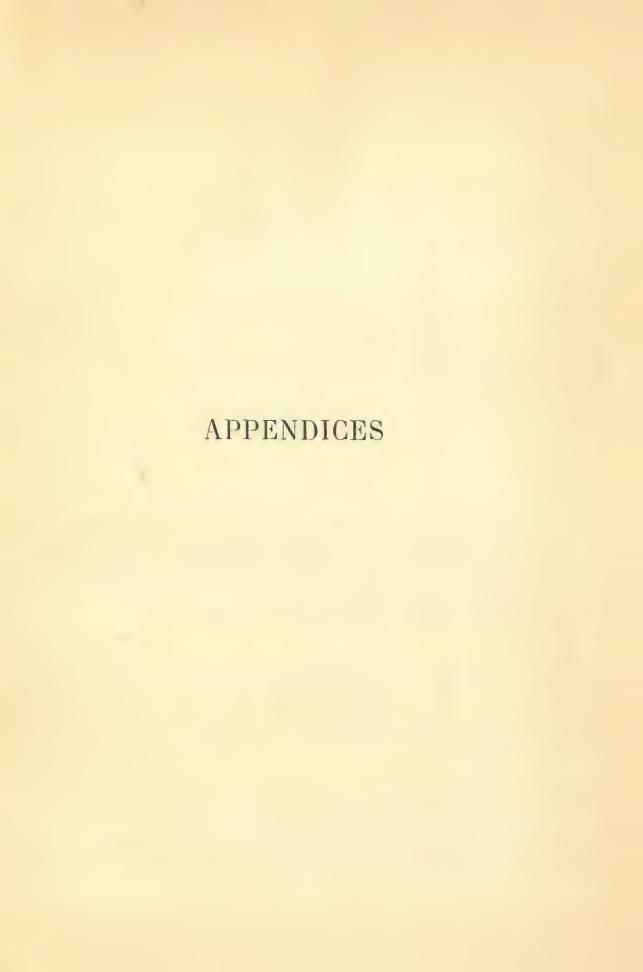
Mr. Roberts joined the 2nd Circle as Surveyor of Contracts.

Mr. Grieve, Surveyor of Contracts, resigned. Omar Bey Abdel Barr and Ali Eff. Showki, Chief Engineers, retired.

Mohamed Bey Choukri and Ahmed Bey Helmi, Chief Engineers of Menufia and East Gharbia, died. Mohamed Eff. Zohdi replaced Ahmed Bey Helmi deceased in East Gharbia. Mohamed Eff. Zahed was transferred from Dakahlia to Menufia, to replace Mohamed Bey Choukri deceased, and was replaced in Dakahlia by Mahmond Eff. Fahmi.

### K. E. VERSCHOYLE.

Inspector General of Irrigation in Lower Egypt.





# APPENDIX A.

Abstract of Accounts, 1903-Indigation Department, Lower Egypt.

REGULAR HEAD.	let Circle.	2nd Circle.	3nf Cimle.	Barrage.	Zifta Barrage.	TOTALS.
Establishment.	LaE. M.	L.E. M.	L.E. M.	L.E. X.	L.E. M.	L.E. M.
Classified staff	9,434,414 4,399,473 2,983,813 251,789 362,081	8,654.981 4,130.937 3,241.313 305.405	7,053,258 2,877,583 2,654,012 130,997 200,000	2,819,250 3,686,935 814,940 67,000 125,000		27,961,903 15,094,928 9,694,078 755,191 687,081
Office charges and furniture	315.249	215.321	00,000	19,844		610.414
Total Works,	17.746.819	16,547,957	12,975.850	7,532,969		54,803.595
Irrigation improvements	6,463,000 4,258,000 8,080,000	1,800,000	3,013.000 1,460.000 6,847.000	2,928,000 5,093,000	1,449,000	33,372,000 7,518,000 30,722,000
tures and study expenditure Repairs of roads Pumping stations Maintenance of canals and drains	6,519,000 1,400,000 		6,739,000 500,000 14,367,000 6,664,541	8,725.000 = 2,747.942		28,697,000 2,457,000 14,367,000 49,441,381
Totals, and Regular Budget	69,233.926	71,401,748	52,566,391	27,026.911	1,449,000	221,377.976
OTHER CREDITS. Corvée abolition Agricultural roads Bridges to replace ferries Contribution by other administrations Sundry receipts	45,999,990 100,000 	12,749,747	26,349,872 1,619,857 236,130 1,339,074	7,649,999 = 5,469,174 1,131,490	_	121,999,122 12,749,747 1,719,857 6,445,304 4,624,428
SPECIAL GRANTS BY CAISSE FROM GENERAL RESERVE.						
Irrigation improvements Drainage works Special Low Nile Credit Special Low Flood Credit Mehallet El Anir dam Damietta sadd (arrears) Zifta Barrage Zifta Barrage subsidiary works. Subsidiary works 1st Circle Ezbet el Borg Reservoir Totals other credits	14,011.260	24,932,000 343,426 369,111	25,631.429	9,818,462 	\$4,587.819 2,682.559	55,038,591 72,117,380 5,458,969 1,319,903 7,870,781 366,485 84,587,819 2,682,559 14,011,260 2,459,744 393,451,949
Grand Totals	171,969.040	169,054,449	132,132.798	51,843.260	81,830.378	614,829,925

# APPENDIX B.

LIST OF NEW AND REMODELLED IRRIGATION CHANNELS EXECUTED UNDER THE HEAD OF SPECIAL WORKS.

ï,	AME OI	CHANS	EL.				New Channels,	Remodelled Channel
							Kilometres.	Kilometres.
	1st	Circle.						
Ghazali Canal Om Galagil Canal		• • • • • • • • • • • • • • • • • • • •			• • •		9·0 9·0	4.0
Buhia junction		***		• • •	•••		4.0	
			Tot	al	***		19*0	4.0
	2nd	Circle.						
Nagail Canal Telwana Canal	400	•••					3.0	48·() 6·0
Radi Canal		•••		***	• • •		2.0	1.0
Melig Canal Salahib Canal	•••	•••					6.0	0.0
Salahib Canal		•••					2.7	0.0
Sharkin Canal	•••	•••	0 0 0				0.0	₹•()
			Tot	al	•••	•••	13.7	59.0
	3rd	Circle.				İ		
Baslaqun Canal Edkawia Canal		• • • •						13.0
Eukawia (anai		900 0		• • •	***	• • •		2.0
			To	tal	***		0.0	15.0
	6	dizeh.						
Khashah Canal		***	• • • • •				2.8	2.7
Kafr Tukhan Canal	• • •		•••••		***	• • • •	0.0	10.8
			То	tal	***	•••	2.8	13.2
		G	rand To	tal	* * *	• • •	35.5	91.5
				_				

# APPENDIX C.

LIST OF NEW AND REMODELLED DRAINS EXECUTED UNDER THE HEAD OF SPECIAL WORKS.

	1	1	
NAME OF DRAIN.	New Channels.	Remodelled Channel.	REMARKS.
	Kilometres.	Kilometres.	
Ist Circle.			
Bahr El Bagr. Bahr Taweel Mit El Amal Masama Timsah	<u>-</u> 6•5	$ \begin{array}{c} 7 \cdot 0 \\ 1 \cdot 5 \\ \hline 2 \cdot 0 \end{array} $	7 bridges, 12 pipes aqueducts. 2 syphons, 22 pipes, 17 bridges.
Total	6.5	10.5	
2nd Circle.			
Batra Samatay Dahria Abshan Wazaria Qebrit and Fua Orban		25.0 18.0 15.0 10.0 6.0 9.0	10 new bridges. 15 pipe aqueducts. 37 acqueducts lengthened. 7 bridges modified.
Total	4 ° ()	83.0	
3rd Circle.			
Umum Damanhour Nedilm		5·0 5·0	35 bridges made. 51 pipe aqueducts.
Nubaria	1.2	10·2 4·8	8 syphons. 5 pipe inlets.
Delingat	12.4	_	The state of the s
Roznfa	5·4 4·1	_	
Kafr Melit	11.0	_	
Mehallet Bishr	3.0	_	
Totul	37.1	26.0	
Grand Total	47.6	119+50	

#### APPENDIX D.

List of Canals subjected to the special programme for rice cultivation.

#### 1st CIRCLE.

#### DAKAHLIA PROVINCE.

Buhia Canal and branches from Barhamtonsh new Regulator to tail.

Gabbada Canal and branches, Bahr Tanah and branches.

Bahr Saghir and branches from Railway bridge at Dekernes to its tail.

Sharkawiet Faraskour and branches from Badaway Regulator to tail.

Om Salama and branches from Mit El Amil to tail.

#### SHARKIA PROVINCE.

Saidia Canal and branches, Saarana and branches.

Samaana and branches.

Bahr Facous and branches from Demiyoen canal head, to tail.

Sadi and branches from railway to tail.

Bahr Moes and branches from Safra Regulator North.

Hanout Canal and branches from Boussa Regulator including Hagarsa Canal. Shebini Canal branches from Zawamel junction including Mit Yazid East and branches.

#### 2nd CIRCLE.

Qoddaba Canal and branches from Badalet El Saidi to tail, this includes the Yusef Eff. Canal, Rashidia Canal and Khalig Berimbal.

Bahr Saidi and branches from head to inil.

Lasefar Canal and branches from head to tail.

Ghonemi Canal from its bifurcation at Aguzen, northwards, this includes the Shaba and Etbn Canals.

Saftay Canal and branches from Kafr Gedid Regulator to tail.

Rowena Canal and branches from Hamra Regulator to tail.

Quaid Canal and branches from Khomar Lock to tail including the Kom El Wahal Canal.

Bahr Mallah and branches from Tombara Lock to tail including the E. and W. Gannabias Tombara.

Bahr Tira and branches from the Abshan Lock to tail including the Abshan Canal and Gannabias, Sharkawia and Nozam,

Rayyah Belqus and branches from the Barari Railway to tail; this includes the Sarama, Hafiz Shihab el din, Bahr Maasara, Banawan, and Bishma Canals.

Bahr Shebin and branches from the Barari Railway to tail, this includes Ramly, Fuzil, Samar and Hag Sherbin canals.

Sahel Canal and branches from the Barari Railway to tail; this includes the Bahr Hesas and Tell Canals.

Sherbin Canal and branches from head to tail.

#### 3rd CIRCLE.

#### BEHERA PROVINCE.

The whole of the Mahmoudia System and Branches.
The following branch canals of South Behera Division:
El Abadia Canal.
Safasif Canal.
Um el Hanash Canal.
Kafr Beni Hilal.
Dessonnes and (private) Um dinar Canal.
Kafr Monsaed Canal.
Kala Canal.
Bahr El Akar Canal, and its branches.
Yaden and Akaline, and the Shakir Canal.

#### APPENDIX F.

# Note of Mr. Molesworth on Abu Zaabal syphon.

As will be seen from the drawings, this is a pipe syphon composed of \( \frac{1}{2} \) mild steel plates. The length of the pipe is 85 metres and the diameter 1:50 metre.

Owing to the conditions of the locality and the impossibility of drying the Ismailia Canal, it was necessary to place the pipe in position without resorting to the usual practice of diverting the canal.

The method of placing the pipe was by means of dredging a trench to the required depth accross the canal, floating the pipe into position, piercing the water-tight doors and sinking into place. The canal banks were then remade over the pipe ends and operations for getting in the necessary pitching and stonework to protect the ends of the pipe and hold up the banks begun.

The pipe was sunk in February 1902, and all efforts to excavate and get in the pitching by ordinary means failed; in spite of repeated attempts, the springs proving too strong and the nature of the soil at site being such as to render the

excavation in such a limited area well nigh impossible.

In August 1902 all attempts to get in the pitching by ordinary excavation were abandoned, and it was decided to sink musonry wells at either end of the pipe and, by boring through the walls of these, it was proposed to establish a through communication. These wells were of brickwork in cement up to a reduced level of 10000 and, in order to drown out the springs, had to be carried up another three metres in temporary masonry before they could be plugged with grout.

The operations of sinking and grouting were successfully carried out and it only remained to dry the wells and bore through into the pipe. But, on account of the wells not having sunk exactly flush with the pipe ends, spaces were left between these and the backs of the masonry wells. The spaces were as much as 13cms, on the upstream and 19cms, on the downstream side. Directly holes were pierced through the walls springs started, carrying back through the newly bored holes such quantities of sand and water as to preclude the possibility of enlarging the apertures to the same diameter as that of the pipe.

Various attempts to cut these holes both by divers and other means were

made but proved abortive.

In April 1903 it was decided to abandon the idea of getting at the pipe ends in "the dry" and by use of divers, and to resort to the method of grouting. For this purpose, all materials, such as stones, piles, etc., which laid been used in the former operations were cleared away from the neighbourhood of the wells, and sand pumps were erected in order to dredge out inverted cones at the backs of the wells with their apices half a metre below the ends of the pipe on the underside. A certain cube was accomplished by this means, but owing to the gravelly nature of the sand, the laborious process of excavating the remainder by

means of divers had to be reverted to. However, the excavation was at length accomplished and everything was got ready for grouting.

To guard against a leakage of cement into the pipe, strong circular wooden doors as shown in Plan III were lowered by divers and tightly wedged up against the pipe ends by means of wooden wedges against the well walls.

A grout tight joint was made between the pipe flange and the wooden door by milling tarred canvas on the door as a fitting strip where the pipe flange would abut.

The holes already broken through the well walls were stuffed with sacking and the wells themselves filled with sand up to a level one metre above the top of the pipe.

Divers then scrubbed the face of the masonry all round the pipe lip where the grout would form a joint against the well. This was done with foundry brushes the bristles of which were shortened to render them stiffer. On all the dirt and slime being cleaned off rubble stone was lowered and packed round the grout pipes which had been placed on each side of the end of the syphon pipe. The rubble stone was built to a level equal of one third the way up the vertical diameter of the syphon pipe, thus filling up the lower part of the dredged cone. This layer was then grouted up, the cement used being "Casale Monferrato" and a solid block of masonry was obtained under the end of the pipe syphon and against the wall back.

In order to economise grout, wooden boxes were constructed so as to overlap the well sides and saddle over the pipe, their position will be better understood from the drawing. They were fixed by iron tie bolts which, on being screwed up, gripped the overlapping ends of the boxes against the well walls. After the first layer of grout had been cleaned these boxes were filled with rubble stone by the divers to a height of half a metre above the large pipe. On this being done, the boxes were covered with sacking and a talus of sand was formed round the sides of the box by passing the sand through a pipe manipulated as a shute from above. This was done to prevent leakage of cement under and through the boxes.

The boxes were then grouted up through the same pipes as were used for the lower layer.

The masonry blocks thus formed were allowed two days in which to set und the wells were then unwatered cleared of sand, and the sacking removed from the holes in the well walls.

Everything was found to be quite watertight and the enlarging of the holes to the same diameter as the inside of the syphon pipe was proceeded with.

This was accomplished and the wooded doors cut through and a perfectly watertight joint was found to exist round the pipe end and against the well back.

Thus for an outlay comparatively small, as compared with the expense incurred in the endeavours to complete the syphon by other means, the work was successfully finished.

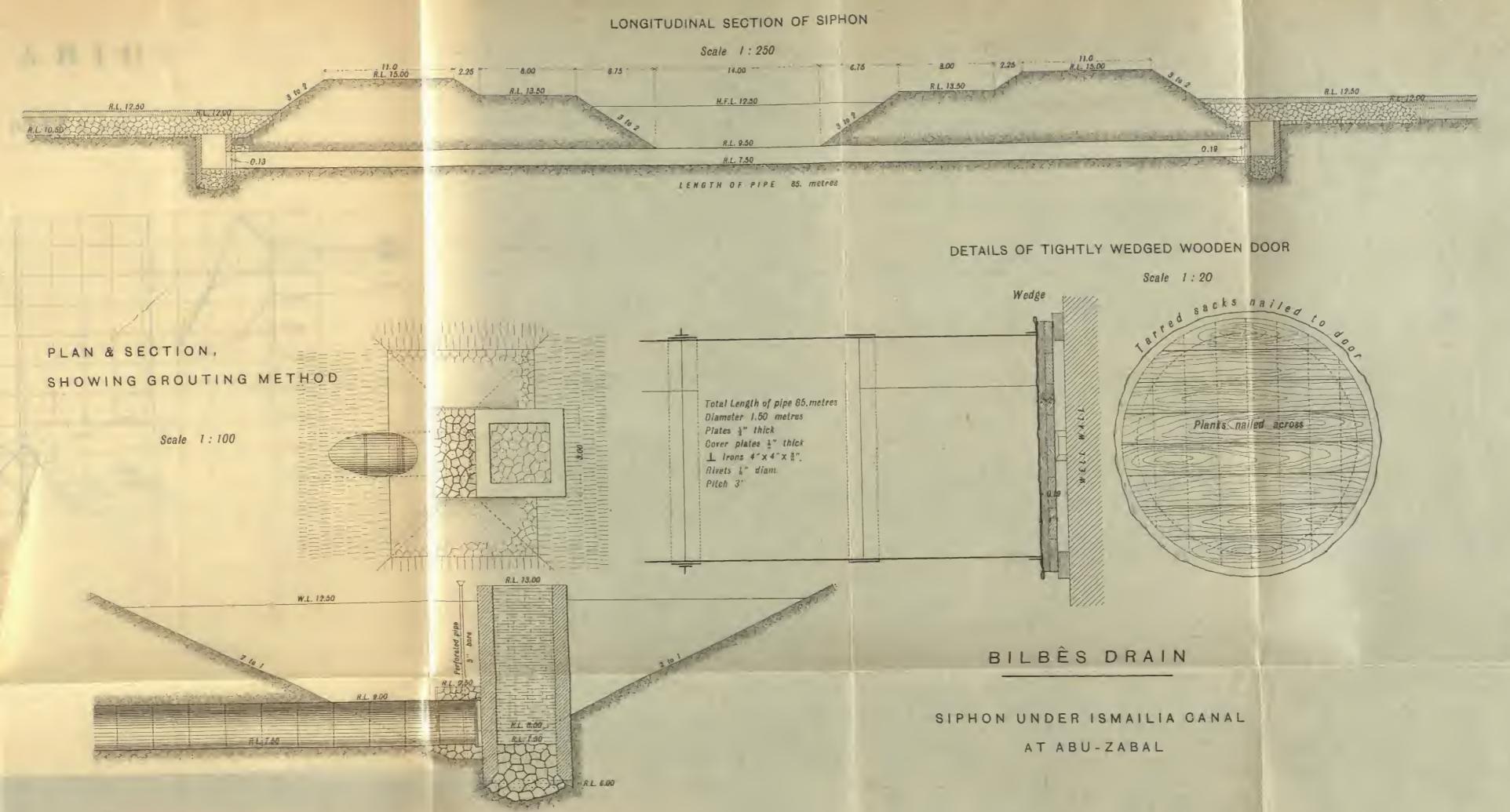
STATEMENT SHOWING THE AREA UNDER DIFFERENT CROPS IN THE PROVINCES, LOWER AND DOMAINS, FROM THE COMMENCEMENT

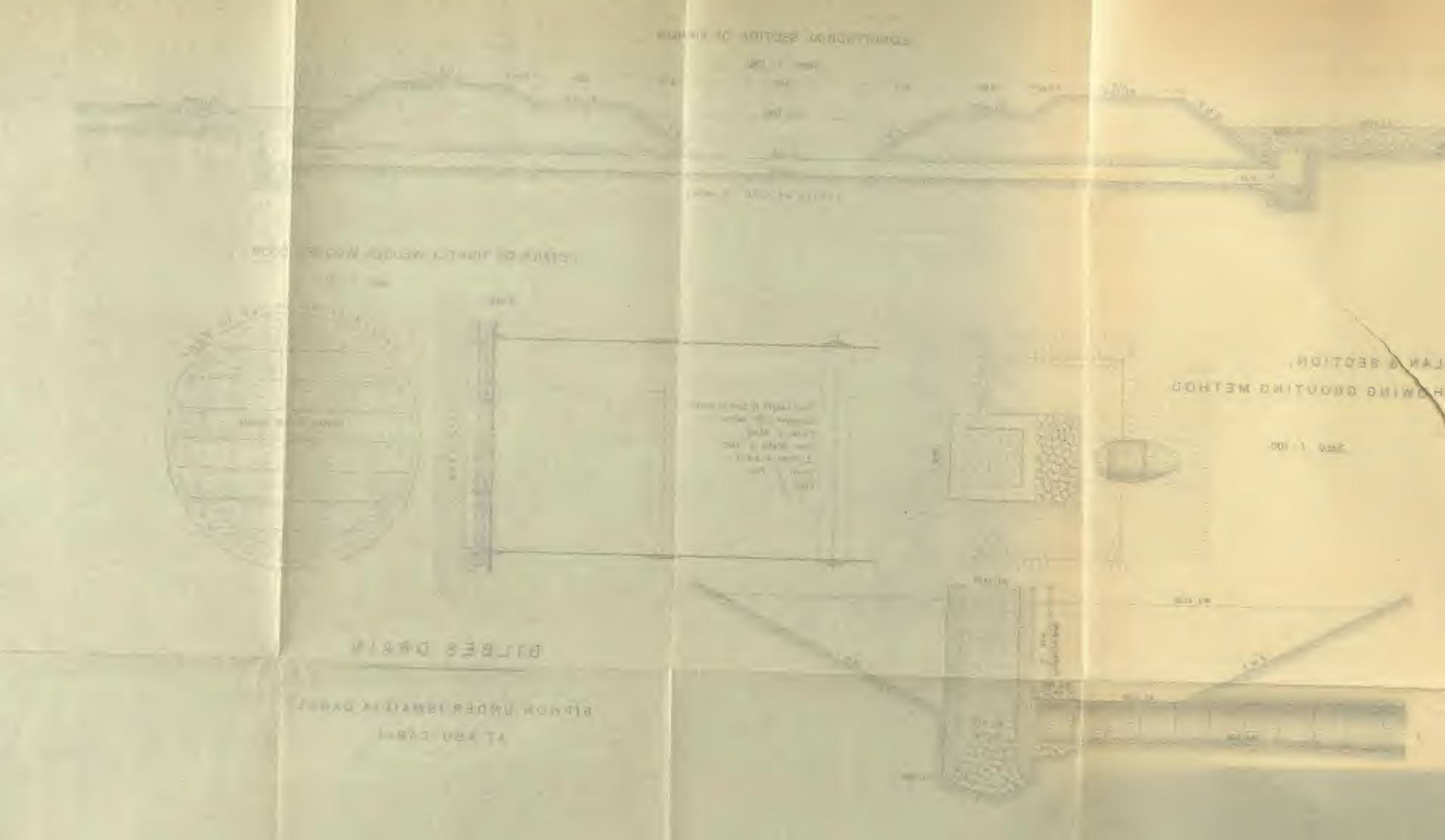
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RECAPITU	LATION.	
Gardens	12	1318 1
Winter Crops	2.140	1,585 13
Summer Crops	1487	1,691
XIII Crops	1.175	5,219 1
Total	L93	1,775

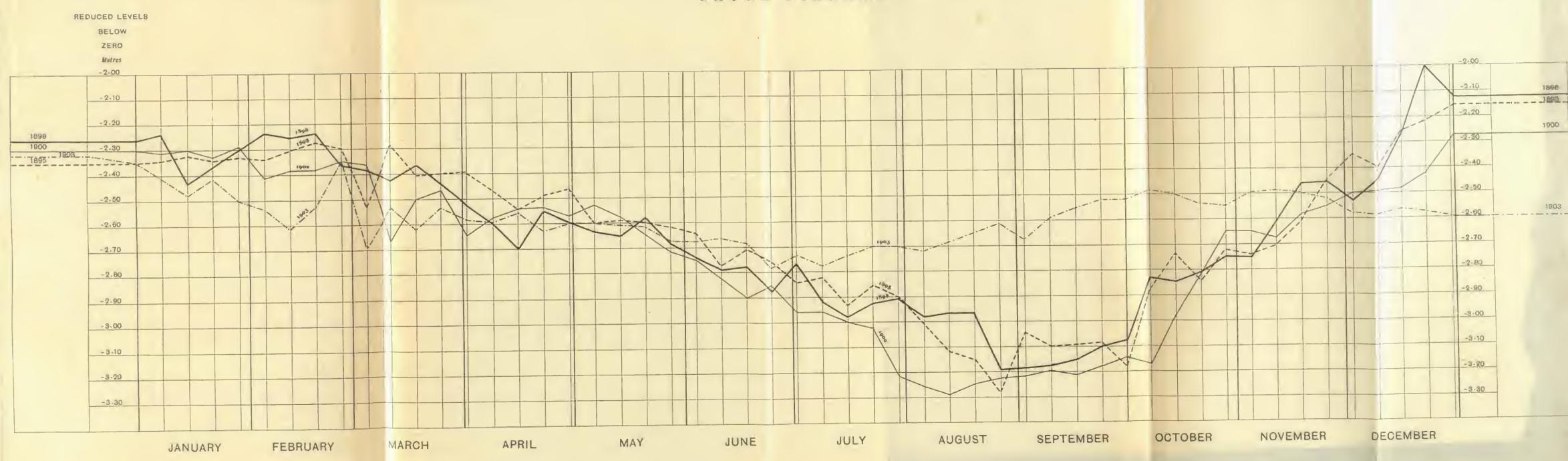


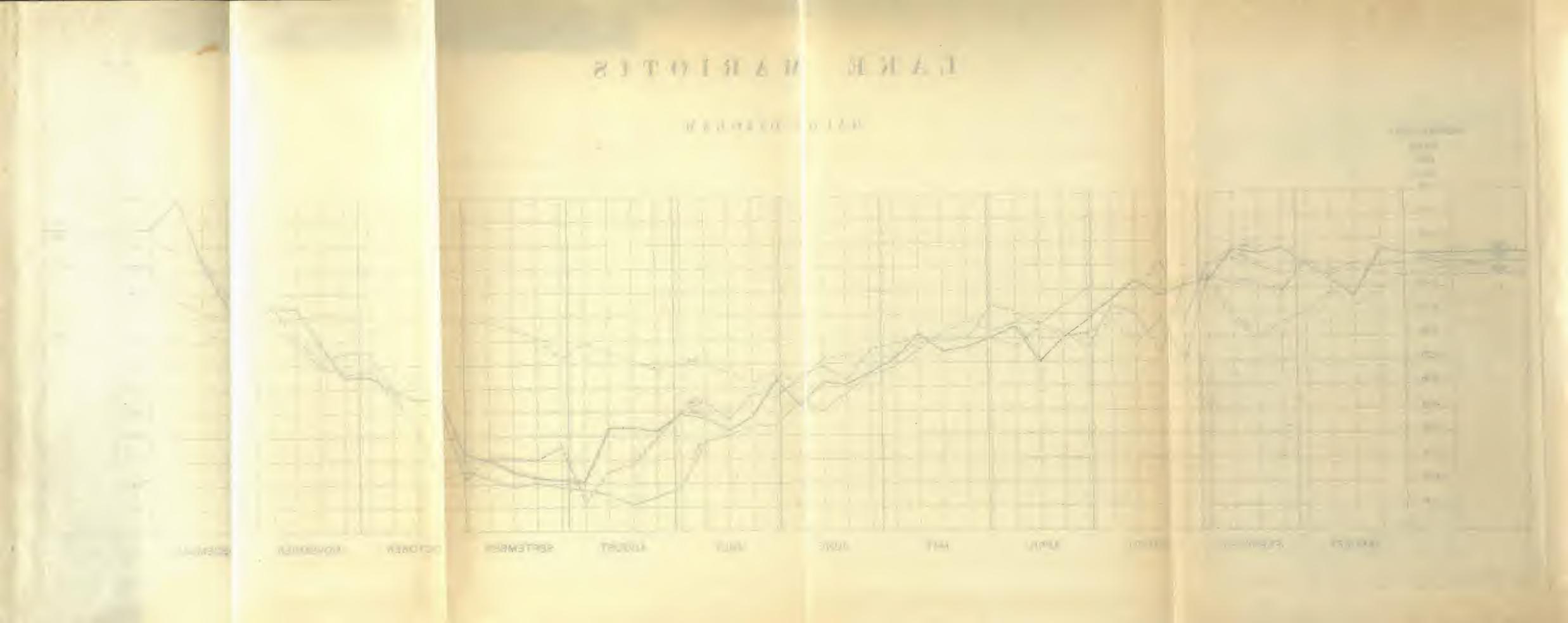




# LAKE MARIOTIS

GAUGE DIAGRAM









# REPORT ON THE TANZIM DEPARTMENT.

1903

BY

A. H. PERRY.



# REPORT ON THE TANZIM DEPARTMENT, 1903.

Cairo, May 30th, 1904.

TO THE UNDER SECRETARY OF STATE,
PUBLIC WORKS DEPARTMENT.

SIR,

In accordance with your instructions, I have the honour to submit my yearly report on the Tanzim Department after revising and abridging the part referring to new works and repairs.

The following Officers are specially commended:—
thief Inspectors.—Messrs. Hewat and Clifton.

SPECIAL WORKS' OFFICE:-

Inspector.—Mr. Pastour.

Director of Works.—Mr. A. De Cosson.

Chief Engineer.—Mr. Watson.

Special Inspection East.—Mr. Richmond.
North Inspection.—Mr. Schauffele.
East Inspection.—Mr. Chapman.
West Inspection.—Mr. Ehrlich.
Cairo Vairie and Tanzim.—Mr. Reboul.
Waterworks, Nurserises, West Roads' Circle.—Mr. Curtis.
Gas, Cart Service and Stores.—Mr. Fitz-Patrick.
Accounts Office.—Yussef Eff. Habib.

I have the honour to be, Sir, Your obedient servant,

A. H. PERRY,

Director General of Towns and State Buildings.



#### GENERAL

#### NEW WORKS

The total sum spent on new works completed or in course of construction during 1903 amount to:

 Appendices
Nos. 1 and 2.

#### LOWER EGYPT

# WORKS TAKEN OVER FINALLY IN 1903.

The Arab Museum and Khedivial Library was finally taken over in September last; the Museum was opened to the public on the 28th of December. The removal of the books to the Library is in progress.

The interior painting of the Library was postponed until after the arrival of the steel book-cases from Europe. It is now finished.

The exterior of the building has recently been cleaned, several additions have been made and others are still in progress.

The imitation marble balustrade for the Library staircase has not proved a success and will, I hope, be replaced by one of real marble before long. The cost of this failure is borne by the contractor.

# WORKS COMPLETED DURING 1903 OR STILL UNDER CONSTRUCTION.

# Egyptian Museum.

# (1) Residence of the Secretary General.

Besides a dwelling house containing 9 rooms for the Secretary General this building contains 4 rooms used as offices for the Director General of the Museum and for the clerical staff.

It has been occupied since September last.

#### (2) Workshops and Sheds.

These buildings are of a very simple character. They consist of stores and repair shops for the excavating plant of the Museum Direction, and cabinet makers and model makers' shops.

They were handed over last January.

# (3) Boab's Lodge, Boundary Wall and Latrines.

These were completed at the same time as the workshops. The handsome railings forming the southern boundary were transferred from Gizeh Museum.

# (4) Changing Roofs of Skylights.

The Museum skylights as originally designed were of two distinct types: the 1st being entirely of glass with sloping roofs; the 2nd having sides only of glass with flat ferro-concrete coverings.

The former were considered by M. Maspéro to be objectionable, owing to the risk of accident in case of the glass breaking and also on account of the excessive amount of light admitted. It was further found impossible to keep such large glass roofs absolutely water tight. They have, therefore, been altered and are now exactly similar to the 2nd type. The work was begun after the tourist season and is now finished.

# (5) Mariette Pasha's Monument.

The monument erected in honour of Mariette Pasha stands in front of the Egyptian Museum to the west of the principal entrance.

The plan is based on that of the exedrae of the ancient academies. Upon the central axis is placed the granite sarcophagus of Mariette Pasha, behind this stands his statue raised upon a pedestal which is flanked on either side by a colonnade of square pillars arranged on the usual apsidal plan and surmounted, by a cornice. This colonnade is built of marble taken from the grand staircase of Ismail Pasha's Palace at Giza and forms a backing to seats facing the sarcophagus. The statue, which is 3 metres in height, is of bronze and represents Mariette Pusha standing with folded arms in Iront of a broken block of granite; he holds a plan of the Museum in his right hand.

The pedestal and statue are respectively the work of M. Edonard Mariette and M. Denys Paech of Paris. M. Prampolini. of the Public Works Department, designed the remainder of the monument.

The work was begun in February 1903 and completed in February 1904. It was carried out by M. Camillo Beato for the sum of L.E. 990.

#### (6) Khedivial Library, book and exhibition cases.

The contract for the supply of these was given to Mr. Panzer of Berlin.

There are 24 book cases of various sizes, capable of holding 51,000 volumes, and 27 glazed exhibition cases which will contain the more valuable manuscripts.

Both book and manuscript cases are made entirely of steel and glass and are absolutely dust proof.

The cases are now being crected by a staff of fitters sent specially from Germany, and should be finished early in March.

The cost of the installation will be L.E.7,000 or L.E.1,000 less than the estimate.

# (7) Arab Museum supplementary works.

A pavement of cement tiles has been laid round the entire building with a garden surrounded by iron railings at the south end. Railings have also been erected along the east façade and round the entrance to the basement to prevent passers by from disfiguring the walls.

Numerous improvements, such as partitions and extra doors have been added to the interior of both the Museum and Library.

It has recently been decided to provide both the main entrances with lobbies and swing doors. These will shortly be ordered and will, I hope, be the last of the items required to complete the building.

#### B.—Interior.

# (1) Port Said Governorate completion.

This building was taken over provisionally last February.

The Government offices are on the ground floor, the upper storey being the residence of the Governor General.

# (2) Kom Hamada Police Barracks.

This markaz is the last of the old type.

The contractors, Messrs. Boyer and Parizot, were considerably handicapped throughout by the difficulty of getting materials to Kom Hamada and the slowness and expense of railway transport.

The building was finished last July and has been occupied since

that date.

# (3) Belbeis Police Barracks.

This building was completed in December. It is of the new type of markaz.

The contract was well and accurately carried out, and reflects great credit on the contractor, Ali Badawi.

I have previously drawn attention to the excellent work of this our only native contractor. The business-like methods which he uses in dealing with his contracts and in organising the work generally, might with advantage be imitated by many of the European firms with whom we have to deal.

A boring has been made in the yard of this markaz and water found at RL+5.40 (4 metres below the surface). This water, though organically pure, was found to contain a large quantity of salt, and the boring was therefore continued to RL—4.60. No more water was found however, the ground between RL+5.40 and RL—4.60 being stiff clay.

The water at RL-; 5.40 is now being pumped and is apparently fit for horses to drink.

# (4) Tanta Police Barracks.

This building was begun last May by Mr. Tréhaki. It is similar to the Belbeis Markaz, but has 3 rooms only on the 1st floor for the Inspectors of Finance and Interior, as accommodation for the Mudir and for the irrigation officials already exists at Tanta.

The work should be finished in June.

# (5) Cairo Central Fire Brigade Station and Police Barracks.

This building is now nearing completion. Besides the fire station and barracks for 128 police, there is a hospital to contain 20 beds and quarters for the Commandant of Police and the Principal Fire Brigade Officers.

The ferro-concrete foundations were described last year, and I will now confine myself to giving an outline of the work since their completion.

The elevation masonry, for which Mr. Garozzo is the contractor, was begun in November 1902 and was, with exception of the tower, finished last October.

The floors and roofs, which are in the Hennebique system of ferroconcrete, were also completed by that date. Some of these floors did not fulfil the specified conditions when tested under 1½ times their calculated load and were consequently refused and demolished. All these are now remade and the second tests have in every case been satisfactory.

Bad centring, by allowing the concrete to sag before it has properly set, frequently rains a floor when the materials and workmanship are otherwise good.

The plastering, joinery, staircases and sanitary work were begun as soon as the masonry was finished and are now well advanced.

The exterior of the building is plastered with hydraulic lime and sand, while for the inside work ordinary lime and sand are being used.

The fire engine and fire escape house and stables are paved with Staffordshire blue bricks ordered from England for the purpose. The engine house is also fitted with patent quick opening doors, the fittings for which were supplied by Messrs. Shand and Mason; steel sliding poles ordered from the same firm provide a means of quick descent from the firemens' quarters to the ground floor.

Recently the progress of the work has been somewhat retarded by a slight settlement of the foundations caused by the considerable difference between the weights of the tower and building proper. The building of the tower was suspended and the ferro-concrete foundations stiffened by lateral ribs arranged so as to spread the weight of the tower over a much larger area than before, and thus minimise the inequality of the loading on the soil under the foundations.

After allowing sufficient time for the new ribs to set, the masonry of the tower was continued and is now nearly finished.

This work is an example of the adaptability of the ferro concrete system of construction, this method of stiffening being more easily executed than ordinary underpinning.

In spite of this delay, the work will, I hope, be finished by the end of March, only one month after contract date.

The design, which has been much admired, is by Manescalco Bey.

#### Zagazig Mudicia.

In the year 1902 it was decided to reconstruct the Mudiria buildings. The condition of the existing buildings, in spite of the fact that they were only 20 years old, was, generally speaking, so bad as to render any attempts at effective reparation useless. A large proportion of the building was in a dangerous state. The drawings and other documents for the new Mudiria were prepared under the supervision of Mr. Clifton. The examination of the tenders and the subsequent superintendence of the construction was entrusted to Mr. Richmond.

Tenders.—No tender was regular in all respects and no tenderer had completely informed himself of the conditions he pledged himself to fulfil. The tender presented by MM. Koressios and Allam, amounting to L.E.35,000, was accepted as being the lowest and the most regular.

Site.—It was necessary to arrange the site in such a manner as to prevent the work of reconstruction interfering with the occupation of those existing buildings which were still in a stable condition and which were needed for carrying on the business of the Mudiria. The site was, therefore, divided into two parts. One of these is destined for the accommodation of the new Tribunal and Markaz. When these buildings are completed the Mudiria staff will be moved into them, the remainder of the site will then be free for the reconstruction of the buildings for the Ministries of Finance and Interior and for the Summary Tribunads. On the completion of the whole a redistribution of the staff into their proper buildings will take place.

The demolition of the buildings upon that half of the site taken over by the contractor began on September 9th. The remainder of the year was spent in carrying on demolitions and in preparing the foundations of the new Tribunals. Materials sufficient for a year's work were brought to and stacked upon the site.

# C.—Justice.

# (1) Mansourah Summary Tribunal.

The commencement of this building was delayed owing to difficulties in connection with the purchase of the site. These have now been disposed of and work was started in December.

The court is placed on part of the site of the old Mansourah Shouna where the new Mudirich and the Mahkama Sharia will also be built.

Before these are begun, however, accommodation will have to be found for the Irrigation Stores at present on the site.

# (2) Cairo Mixed Tribunal additions.

This contract, which was undertaken by Messrs. Padova, Léon Rolin & Co., is divided into two parts.

- (a) The Annexes to the east of the main building which consist of a Summary Court room, a room for the archives, and the offices.
- (b) Upper Storeys on the two wings of the existing Mortgage Office.

Both buildings are of a simple character and require no detailed description.

The Mortgage Offices are already finished, while the Annexes are well advanced and should be ready for handing over on the expiration of the contract in March.

Patent rolling shutters have been fitted to the Archives Office, as the height of these windows above floor level is such that it would be incovenient to open and shut the ordinary type of shutter.

At the suggestion of the contractors the locally manufactured "Massarah" cement was tried for one of the ferro concrete floors of the annexes. This floor, when tested under 1½ time the specified load, proved so satisfactory that the contractor was authorized to use Massarah cement for the ferro concrete roofs of the building, on condition that each roof was tested. The results of these tests were in every case excellent.

#### /).-Posts.

# (1) Port Said Post Office.

This building was completed and handed over to the Posts Administration last April.

During the progress of the work it was decided to suppress a portion of the upper storey, as the building originally designed contained more accommodation than was required.

#### E.—Education.

# (1) Cairo School of Law.

This building was completed last October. Accommodation for 200 pupils is provided with a large lecture room, a library, administration block and quarters for the principal.

The foundations and most of the elevation masonry were finished in 1902, and during the past year, the work has consisted chiefly of plastering, joinery, floors, staircases, etc.

The building is fitted with electric light.

This design, which has found much favour, is also one of Manescalco Bey's.

# (2) Shibin El Kom School.

This school was finished in April 1903. Accommodation for 150 pupils is provided in the main building which consists of a central block and two wings. There is also a large dining hall and kitchen.

A prayer room and a house for the Public Instruction inspectors are still required, but no funds are at present available for these.

# (3) Sanieh School.

This is the largest of the buildings at present under construction.

The ferro concrete foundations, which were described last year, were completed in October 1902, and since that date the progress of the work has been steady, though at times somewhat slow. The masonry, floors and roof are completely finished, and plastering and joiners work are well advanced, while a start has been made with the wooden verandali round 3 sides of the building.

Unless some unforeseen delay occurs the work should be ready to be handed over by 13th of June next when the contract period expires.

Since the commencement of the building a large number of modifications have been introduced at the request of the Public Instruction authorities whose requirements appear to have altered considerably since the original plans were approved by them. These changes include the conversion of two dining-rooms into one, the entire remodelling of the servants quarters, extra entrances to the play ground, and numerous structural alterations to the interior of the main building. We are fortunately able to execute them without incurring any excess on the estimates, but the amount of extra work involved by the necessity of altering plans, rearranging prices, etc., was considerable.

The Ministry of Public Instruction have also asked for other additions to the building, notably a house and lawn-tennis court for the English teachers, a boundary wall to enclose the land added to the site since the original estimates, and a hot water supply for the school.

The cost of these was estimated at L.E.4,000 which sum was not available last year; it has, however, been sanctioned for 1904 and the new works will be begun shortly, and. I hope, finished at the same time as the rest of the school.

Mr. Clifton expresses his entire satisfaction with the work of the contractor, M. Basile Antonion. This gentleman undertook the contract at a particularly low price, one in fact which can leave but a bare margin for his profit. In spite of this he has spared no trouble or expense in providing the best materials and workmanship obtainable,

Credit is also due to our resident Engineer Ibrahim Eff. Bourhan.

#### F.—Prisons.

The only work in connection with the Prison Department during the past year has been at Zagazig; there a hundry, a kitchen and work-shops have been built and a latrine block is now under construction.

During the absence of Mr. Rodeck, the Prisons Administration architect, on sick leave, M. Slater has been transferred from this office to supervise the Prisons buildings.

#### UPPER EGYPT

#### Survey Department.

#### Helouun Observatory.

Meteorological.—This building is on a plateau and the floor level is 114.675 metres above sea level, and is designed with the rooms enclosing a quadrangle. The rooms are all sheltered from the sun by an inner and outer verandah. The main entrance is in the principal façade and faces west and is under the tower containing the 9-ton settling tank. There are also entrances in the quadrangle on the north and south, the latter for access to the amex containing, E.C., buth room, kitchen, servants rooms, store and service E.C.s.

The main building contains sitting room and bedroom for the superintendent, dark room, workshop, room for the standard clocks with double walls, rooms for seismographs, anemometers, recording rooms and offices. In all 12 rooms. The ashlar stone pedestals for standard clocks and seismographs are well into the rock foundation. The floors are 1 metre above ground level, hollow underneath and well ventilated with east iron gratings in the outer walls and arched openings in the inner walls.

A filtering tank receives the water from the 9-ton settling tank, and clear water is distributed throughout the main building and annex. The bath room and kitchen are supplied with hot and cold water. These buildings are founded on rock. English locks are fitted to all doors.

Transit.—This building is 101 60 metres to the east of the Meteorological Observatory and is designed to contain the Transit instrument and the 2 collimators. These are supported on ashlar stone pedestals. The floor level is 118 779 above sea level, hollow underneath and well ventilated. This building is also founded on rock. The vertical and horizontal iron shutters were supplied by Messrs. Cook, of York, England, and were fitted up by M. Boyes, of the Bulak Engine Works. These shutters are all worked from inside.

Equatorial.—This building was designed to carry the 30-feet diameter nuntz metal dome supplied by Mr. Cook, of York. The floor level is 125-596 above sea level and the dome roller path is 4:08 above floor level.

The height from floor level to top of the dome is 8.75 metres. The floor is 1½ metres above ground level. Great care had to be exercised in laying the roller path, on the ashlar masoury. The dome and all fittings were erected by Mr. Boyes, of Bulak Engine Works, and as a proof of the excellency of the work done, the dome can be turned round on its roller path with only one hand on the rope controlling the travelling gear.

Magnetic.—The building is of exceptional design, the object being to maintain in the interior rooms for magnetic observations a temperature of from 1 to 5 cents, also that the hygrometric condition of the air should be such as to avoid moisture being deposited on the instruments. The walls are double, each being 0.75 cents, in thickness with double roofing of the same thickness. There are 3 interior and one exterior rooms with interior passages 1.50 in width all round the 3 rooms. There are 19 ashlar pedestals well bedded into the rock upon which will be placed the magnetic and other instruments. The interior doors are double, padded with cotton and covered with green cloth, and are worked by balance weights. The brass locks and brass basement openings were specially made in England. All the materials used in the building had, of course, to be non-magnetic. All brass work was tested before being put into the building.

The excellence of the site upon which all these buildings are erected and the fact that the surrounding hills are Government property, form a sufficient guarantee, for the future protection of Observatory interests. The transfer of all these buildings from Abbassich to the Mokattum hills on the eastern side of Helwan now, I believe, adequately fulfil the requirements of the Survey Department.

# Ministry of Public Instruction.

Polytechnic School, Ghizeh. (Vice Principal's House).

This house which forms part of the contract for the Polytechnic School now under construction was completed in October. It is a similar house (but larger) to that designed and built in 1902 for the Principal of the School of Agriculture and Polytechnic School.

The cost has been L.E.1.740°327 against L.E.1,588°010 the cost of the latter.

The area occupied is 315 square metres and cost L.E.5,52 per square metre, Mr. Mackenzie's cost L.E.5.87 per square metre.

New Lateines, Beni-Suef and Ghizeh Schools.

The new latrines, tank and pump, etc., built at Beni-Suef School will form part of the new School when money is available.

The new latrines built at Ghizeh School replace the old Mohamed Aly type to be found in almost all these old schools. The filthy condition of these latrines should be seen to adequately realise their condition. The Sanitary Department should at once condemn all these old latrines such as I found at Edfou, before the new latrines were built in 1902.

#### Public Works Department.

South Enclosure Wall, Zoological Gardens.

This wall is 433:40 metres in length and for a short distance crosses the lake. It is built of brickwork with concrete foundations and an artificial stone cap.

The cost was L.E.1,090 or L.E.2.52 per lineal metre.

#### Justice.

Luxor Summary Tribunal.

A Summary Tribunal was built at Luxor for the Ministry of Justice. It is of the type adopted for all Egypt by the Commission appointed in June 1899 and approved by the Judicial Adviser in the same year. Some modifications are being made in the Fayum Tribunal under construction.

#### GENERAL

During the months of January and February the terms of the general and technical conditions for building contracts and the printed forms made use of in the Building Department were entirely revised by Mr. Richmond. As regards the first, the work consisted in arranging the sequence of the existing clauses so us to agree, as far as possible, with the various stages of the operations to which they apply. Existing clauses were, in many cases, remodelled in accordance with

needs indicated by experience. Forty-five new clauses for the most part dealing with technical requirements were drafted. Copies of the proposed conditions were sent to the Inspectors for their opinions on the reception of which the work was again revised before submission on the 3rd March to the legal authorities. After further discussion the draft was sent in its final form to be printed on the 13th April.

The printed forms used for the preparation of quantities, specifications, sunctions, process-verbaux, and monthly payments were renranged with the object of allowing wider spaces for figures and thus diminishing the chances of error in sums and quantities. This work was carried out on lines similar to those followed in the revision of the general specification. Preliminary drafts having been prepared they were submitted to the Inspectors for their opinions. After the final form had been decided on 144,700 copies were printed.

The new forms as well as the new general and technical conditions

have been in use since the mouth of May.

Many demands have been made on my Department for the loan of engineers. Mr. Pastour was occupied on work for the Alexandria Municipality Commission (from September 1902 to the end of that year); Mr. Watson was transferred to the Sudan (from March to September 1903); Mr. Slater, as already mentioned, has been lent to the Prisons Department.

These transfers are extremely prejudicial to the efficiency of my Department especially in view of the limited number of capable officers

at my disposal.

The incompetence of a large proportion of the permanent Tanzim engineers is thrown into bolder relief in proportion as the duties

devolving on them become more ardnous.

There has been a considerable improvement in the drawing and working out of details made by the engineers staff. I regret to find that owing to the very low rate of salary which can be paid the tendency is for those who have mastered the general principles to leave us for better paid employment in the irrigation, etc.

The admitted insufficiency of permanent officers has led to the employment of a number of provisoires agents. Many of these are equal or superior in capacity to the graded staff. By Finance Circular, No. 735, dated 30th November, 1901, however, we are forbidden to raise the pay of these employes above L.E.S. They very naturally resign when better terms are offered.

The Tanzim Department has suffered great loss in the retirement of Said Pasha Choucri to whose long and faithful services I would pay a

grateful tribute.

#### REPAIRS

The value of the public buildings existing in 1896 may be taken at	1.E. 5,000,000
structed to the value of	1,204,000 L.E.
and for the new at ½%	150,000 6,020
	The amount required for repairs to the old buildings at an average of 3% equals per annum.

Against the 156,020 required per annum we have at present a budget allowance of L.E. 58,925 including Prisons. Sanitary and Customs.

Special credits were granted to the amount of L.E. 17.500.

A question which has reached an acute stage is the delapidation of the Government offices in Cairo and the provinces. Many of these are in a state which renders repair impossible, except at a cost out of all proportion to the advantages gained.

Proposals will be submitted in 1904 for reconstruction of the most insecure of these buildings.

The Opera House has been condemned as thoroughly unsafe as regards danger from fire. There are no satisfactory exits,

With the budget at our disposal my report can only be a record of unsatisfactory makeshifts.

Among the more important repairs executed in 1903 may be mentioned.

37 110 4	1.,E.
Modifications to Opera House	1,050
1st storey on 1', W.D. Laboratory	800
ZVIDENCE TO I FIREIRE PROUSE	650
Conversion of women's Prison at Bulak into girls'	1,11,10
School	650
Partial renewal roof Gonvernorat	650
Play ground and grand stand for Darl-el-Gamaniz	4.37.94.3
School	9 . 1
Della vent provi i la reste da la llatta	1,450
Woodification of the Francisco Louding	300
Modification of the Egyptian Institute	350
Sorting room and general modifications Post Office	900
Repairs to Dakahlieh Mudirieh	725
to Damietta Gonvernorate	500
to El-Arich Gouvernorate and wells	1,000
to Mansurah School.	505
Restoration Kom-el-Chongafa catacombs	2.475
Repairs to Rus-el-Tin School	3,000
Paluce	14,500
010 001	T. Kinkling

A certain percentage of the roof area of various ministries has been completely modified. The old system of adding a layer of concrete whenever a leak was discovered resulted in some cases in the imposition of a permanent load varying from \(\frac{2}{3}\) to \(\frac{1}{2}\) a ton per square metre of the supporting joists. The factor of safety was in many cases reduced to 1.

#### RAS-EL-TIN PALACE.

The renewal of the roofs of the palace and its amiexes were begin in 1901 and completed in 1903.

The work or repairing a roof area of  $3\frac{1}{3}$  acres was put up to tender on the 5th January 1903, and the whole work was completed in three months for a sum of L.E. 14.500.

The total roof area of Government buildings in Alexandria and Behera (excluding Customs which figure for 10 acres) amounts to nearly 16½ acres.

78% of this area is asphalted.

In 1903 4\frac{3}{4} acres were entirely renovated, the renewal including roof timbers.

The total area renewed since 1901 comes to 103 acres.

Some 60% of the flooring of buildings dating from 1830 is rotten and must be renewed.

An examination into the cause of leakage through the roof of the new ferro-concrete tobacco stores roof in Alexandria led to the discovery of a sag in the main girders, the flexure being in one case  $\frac{1}{4}\frac{1}{5}\frac{1}{6}$  of the span instead of  $\frac{1}{10}\frac{1}{60}$ .

The girder was demolished and in course of this operation it was found that the workmen had omitted to put in the proper number of stirrups forming the web connecting the iron compression and tension burs and that a certain number had been placed upside down.

The efficiency of this excellent system is more or less at the mercy of careless workmen.

The heavy tests applied act, however, as an almost perfect guarantee. The construction and supervision of works of the Customs Administration was withdrawn from my Service for reasons explained in your official No. 7,236 of 25th November 1902 which read as follows:

"It is assumed by the Customs, that the Ports and Lights, by using "their existing staff and the extensive plant they possess, could work "far more cheaply and expeditiously than a contractor. Theoretically "the argument is sound and the project worth a trial."

Some 16 works, detailed below, were carried out by the Customs :-

- 1. Inflammable store on Gabbary Quay.
- 2. Kiosk with 3 rooms for Mamour and storekeepers on Gabbari Quay.
- 3. Kiosk, one room, for guards on Gabbari Quay (gate 32).
- 4. Kiosk, 2 rooms, for guards and gute-keeper on Gabbari Quay (gate 23).
- 5. Foot bridge over railway and coal quays.
- Kiosk, 2 rooms, for gate-keeper with room above for guards (gate 14).
- 7. New 3rd class, Taftich and Passport Office with quarters above.
- 8. Kiosk, I room, for Mamour Kism 7.
- 9. Kiosk, 1 room, for gute-keeper (gate 8).
- 10. Room over guards' office at gate No. 6.
- 11. Painting, etc., outside main building.
- 12. Alteration to stores in Tobacco Department.
- 13. Enlargement of parcel posts by including another store from the Tobacco Department.
- 14. Repairs to roof of old Menoufieli.
- 15. Walls round sheds No. 5, 7, 9, 13 et 14, one metre high.
- 16. Painting, etc. Sheds No. 12, 13, 14, 15 and 16.

Of these only Nos. 1, 5 and 7 were executed by the Port Engineer, but they were, I believe, given to contract and not carried out by utilising the plant or staff of the ports.

The rest of the works were given to contract by the Customs in the same manner as had previously obtained. The execution was not, I believe supervised by engineers.

I infer, therefore, that the spirit of the arrangement made has been infringed and that no benefit has resulted, unless freedom from technical control can, under certain circumstances, be considered as such.

# THE SMALLER MAHKAMAS.

Appendix No. 8, In 1901 Mr. Hewat designed two type buildings for Egypt which were approved and signed by the Ministry of Justice. In Muderyah towns there are the Mahkama Ahliyah (which are being built gradually), the Mahkama Sharia and the Mahkama El-Murkaz El-Sharia. In districts, the two latter only are required. There are in Upper Egypt 8 Mahkamas Shariyahs and 42 Muhkamas Markaz.

The present condition of these buildings is most deplorable. They are generally dwelling houses, rented and quite unsuitable for the work to be done. Mr. Hewat reports that he found the clerks at work in a room with a unid floor and open to the sky, simmer and winter. In Manfalût much the same state of things obtains. The filthy condition of the many Mahkamas which he visited are, he says, beyond description.

The plans and documents for adjudication have been ready for two years, but no money has been found to build, either large, or small.

#### LIST OF MAHKAMAS SHARIYAH.

(Moudinien).

#### IN UPPER EGYPT.

M

IAHKAMAS SHARIYAH.	GOVERNMENT PROPERTY OR RENTED
I.—Gizelı	Government
2.—Beni-Suef	Rented
3.—Fayum	Government
4.—Minieh	Rented
5.—Assint	Government
6.—Guergueh	Rented
7.—Keneli	Government
S.—Aswan	Government

#### LOCAL COMMISSIONS

Appendices Nos. 9, 10, 13, 14, Small water works now exist in the following towns:-

LOWER EGYPT.	UPPER HOYPT.
Mehnllet-el-Kebir	Sohag
Knfr-el-Zayat	Minich
Zifta	Girm
Chebin-el-Kom	Luxor
Mit Ghang	Beni-Suel
Zagazig	Keneli
Benha Mausurah	
Manishran	

Installations on a larger scale are projected:—

at	Zagazig					• • •		L.E.	6,640
	Mansurali Manuf	* * *	* * *	* * *	• • •			* 4	18,000
	Mennf Chibin-el-K	om	* * *	• • •	• • •	* * *	* * *	• •	4,860
	Damietta								
	Damanhour	,							

At Aswan the capacity of the 10-h.p. engine and pumps was calculated to give a sufficient discharge for road watering in addition to a supply of 25 litres per head taken on 75% of the population.

This provision was in comparison with the measured supply drawn at Tanta very ample and from experience should have avoided the necessity of additional pumps for many years.

The town Council, however, after only two years, are erecting additional engines and pumps of 17-h.p. and have shown a satisfactory profit in spite of undoubted waste of water.

The rejection from motives of false economy of the proposals of the Public Works Department to maintain a mechanical engineer for the purpose of insuring the proper supervision of the water-lifting machinery led to the break down of the Aswan pump and caused considerable unnecessary expenditure.

The engineer has now at my urgent appeal been reinstated. Small fire engines have been bought by the Local Commission of Damanhur,

Aswan and Fayum. The Engineer in Chief of the Local Commissions reports that at present there is no mechanic capable of working them in the villages. (Vide the following extract from the Egyptian Gazette of the 15th May 1904:—

#### "THE FIRE ENGINE.

"Medinet-el-Fayoum's new fire-engine was found to be absolutely "nseless this morning when a fire broke out, as the engine could not "work awing to its injector being out of order. As a result the honse "where the conflagration occurred was completely burnt out."

In my opinion far too much liberty in technical matters is granted

to the Local Commissions.

The authority of the High Commission which is a purely deliberative body where the opinion for the technical member is only of equal value with that of the non technical does not constitute an efficient check.

#### LUXOR, HORSE GEAR PUMP.

In May it was decided to put a pump in the well existing in the English Cemetery, Luxor. Advantage was taken of this opportunity so as to enable as to water the Karnak road and also give sufficient water supply for the cemetery garden from the same well.

A Hayward and Tyler horse gear and deep well pump was ordered. The pump is a 3-throw with barrels 3" diameter and section and

delivery 2".

The pump is placed 2.50 metres below top of well. The well is 1.50 diameter and the maximum rise and fall in the well (flood and summer levels) is 7.30 metres. The well is 10.30 deep. By opening or closing a valve, either the cemetery can be watered, or the water raised to the road watering tank. A tank of 7 metres capacity with columns, etc., has been erected on the Karnak road.

This tank can be tilled in one hour.

The cost was :-

						Los Bins	All a
Pump and gearing from	England	 	• • •	 			250
Tank columns, etc							662
Masonry foundation, etc.							534
Erection of ironwork		 p 4 2		 		aru	380
		Tota	ıl	 	L.E.	280	826

#### GIRGA WATER SUPPLY.

The pumping station is placed at the north end of the town. A 4-h.p. Tangye petroleum engine drives a 3-throw vertical double acting pump. The water is raised direct from the river into a 30-ton tank placed on the top of the building. The section is 5 inches in diameter and the delivery pipes 6 and 5 inches. 751 metres of 5-inch piping and 352 metres of 6-inch piping were laid through the town. At different points in the town arrangements are made for the water supply to the inhabitants and a service adopted for street watering.

The sanctioned amounts were :-

Pump engine and piping, etc.	 • • •	***	•••	•••	936	071
Masonry	 	•••				M. ()()()

The actual cost has been :-

Masonry	••• •••		• • •		181 155
	Total	***	* * *	L.E.1,583	339

Balance in hand L.E.87,736.

This pumping station and all others in Upper Egypt are now handed over to the Ministry of the Interior. Future works and repairs will not be taken in hand by us.

## SUHAG WATER SUPPLY EXTENSION.

To admit of a water supply at the higher parts of the town, the tank with a capacity of 28 cubic metres was ruised 2.50 metres. A new petroleum engine of 6 h.p. was substituted for the 4 h.p. 278 metres of 5" piping were laid and stand pipes for street watering were placed in convenient places in the town. A 3-throw lift and force pump with 3 vertical barrels and top gearing was substituted for the old centrifugal pump in May 1901.

The works were completed in April 1903, and the total cost of this extension was L.E.472,911.

#### WATER WORKS.

Owing to the technical ignorance of many of the Tanzim engineers, great difficulty has been experienced in obtaining reliable data on which to base statistics of the cost of water raised by the local Commissions water works. The bare cost per cubic meter works out at from 0.7 to 1.94 milliemes; if we double the maximum figure to allow upkeep depreciation and amortisation and add 100% for inaccuracies we arrive at a figure of 6 mill, per cubic metre.

This compares eminently favourably with the mill. 27 per m.c. charged at Assiut by the Cniro Water Company and the local Cairo rates of mill. 27 for filtered water, and mill. 23,14 for unfiltered water.

Appendix No. 14.





CHIEF INSPECTION SPECIAL BULDINGS, UPPER EGYPT.

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CHIEF INSPECTION SPECIAL BUILDINGS, LOWER EGYPT.

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	Sunrthin.	12	1.1.1	1,300	3,115 2,900 8,100 1,000	8,000 1,000 1,000		100 mm m	15.45 10.00		25,325	2000 H		111
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	NAME OF WIRE.	5.00		Egyptinn Museum - Reprint General.	linds beign, tonneign, wall and lattings for the kylights	Marketta Pasia's Monument Khodivial Library Book and Exhibition Cases.	Amb Museum suplementary works	9-2-303 Port-Sald Governorate completion	Inita, Police Barrackii Cairo Central Fire Brigade Station	Mansourh Summary Tribund		a 0 a 0 v 0	English Schools	5-9-903 Zagazig Workshop
Date of	during 1901		=	11(6)-6-6	3-1-603	28-11-62	ı	9-2-103 8-7-103	12-12-10	1	4-1-903	31-10-903	1	20-9-6-0
	Administration.		=	General.	• 0 • 0 • 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	80 0 0 0 0 0	Interlur.	9 0 0 9 0 0 0 0 0 0 0 0 0 0 0	. F 12 18 5 12 18	Pasts.	Elkention		Princing.
	Order	İ	-	A_A	21 27 .	- 13 19	to	1 - 61	77 - A	ال	4	243	25	22 TH

#### Appendix 3.

# CHIEF INSPECTION SPECIAL BUILDINGS.

LIST A.—WORKS TAKEN OVER DEFINITELY DURING 1903.

Order.	Administration	Name of Work.	Dake of eximpletion,	Suretton for works.	Cantexriustye of Architectal	NAME OF CONTELL TOR.
				L.E.	L.E.	
A.	tieneral.					
1	- )	Egyptian Museum Rest dence of Director Gl	20-10-902	4,444	\$_46 it 1	Garvezo & Zaffrani.
2		Egyptian Museum Police Quarters	23-12-502	\##1	7.35	tismozzo & Zaffmai.
3		Arab Museum & Khedivlat Library	16-9-9-2	57,142	a5,815	Marsill & Trèliuki,
4		Boulae Stables	22.4).902	10,000	5,970	Zatīrant. Annigoni mul Gamlotā.
10		Tanta Tanzini Office	1-6-902	2,0740	1.1902	Margussof Bey.
2%		Model Workshop	15-10-902	11,053	10,924	Tréhakt.
B. 1 C.	Interior.	Police Burraks Nawa	1-7-902	3,741	2,516	Ali Badawi.
1		Cairo Nativo Court of Appeal trehives	13+ %, [ ]	2,140	[ <sub>2</sub> (m)ic)	N. Marelano.
4		Port Sald Summary Law Court	20-12-902	4,250	4,386	Guétin & Charvant.
D, t	Education.	Addition of 3 rooms to Abbas School	::::::::::::::::::::::::::::::::::::::	fi.jei	611	Zaffrani, Annigoni and Gaudolfi.
ì		Monthly Prisons	1.5.902	_	15,146	N. Prosperi.
64		Zagazig Hospital	1-0-402	-	4,271	Glezzo & Fedrigo.

Appendix 4.

# SPECIAL BUILDINGS, LOWER EGYPT.

Table showing cost per meter square and meter cher of buildings taken over finally in 1903.

							-	-	
								_	
	NAME OF WORK.	Tows.	Todal cass exclusive of Architecta	Surfaro ooyenst.	Vuluma.	Cost per Nr.	242	Chet per Mi	I Agath Pathow.
			11C.	Ma	N.3	L. S. M.	111111111111111111111111111111111111111	=	
1	Arch Museum & Khedlyind Library	t'nlru	100 B 11	8,910	97,630	97,610 14 275		0	Part Impenieur, ground floor, 1st floor and 300 M² 2nd floor.
	Realdence of Phrector General Egyp-	Cultur.	1,610	2542	6,015	12 (152	5	100	Basement, granted door, 1st their and 100 M? 2nd door.
-	254	Cate	ESC:	203	1,683	450 400 400 400 400 400 400 400 400 400	0	103	Single aborey.
. 22	N. Constitution of the con	(hille.	8,979	1.170	06210	6 102		125 0	Single storey and boundary wall.
į (m		Tunkt.	1,766	1:-	1.H25	10 327	=	0330	Greened thuer, but theer, versioned Mr M.
. 7		Calro	10,611	SED C	21,426	1 (N2)	=	125	Ningle there, steel transfer that ever this MP.
(100)		NINTH.	0.00	Dig.	1,670	- NA		11-12-0	Ground theor, and 154 Mr 1st floor.
4 40	14	Chilm	119	157	:4:40:	**	=	5	Bounts a native likh.
~	Archiven for Native Court of Append.	Cuire	1,900	11.	2,52,5	15	=	200	Mingl. Hurry.
7.	Summery Law Court	Part Said.	1227	(n.E.	4.280	0.02 11		910	1 old bugle storey.

From halfway between ground level and buttom of foundation, or where there is basedrout from half way between insenion thou and lottom of foundation N.B.—The heights for calculating the volumes are measured as follows:-

Wooden verandaha, sheda, etc., are ignored in calculating the volumes, though their cost is included. to roof lovel, neglecting parapat for that roofs, or to half way up slope of sliquid roofs.

#### Appendix 5.

# GENERAL STATEMENT OF NEW BUILDINGS

#### EXECUTED

# WITHIN A PERIOD OF 8 YEARS COMPRISED BETWEEN 1896-1905.

LARGE BUILDINGS.		
No. of Francisco Asimilar (Handwards and	L.H.	М.
Museum of Egyptian Antiquities (Constructions and Sundries)	256,521	_
Arab Museum and Khedivial Library (Price of land and furniture not included)	51,300	_
Native Court of Appeal, Governorate and Mixed Prison (Price of land and furniture not included)	92,000	_
Tutal	309.821	_
Schools.		
	L,E.	м.
Assuan	2,515	_
Caire (Model Workshop)	14,250	-
" (Nasrieli School)	29,058	_
(Abbas School)	7,256	_
(School of Girls) Teachers' house	789	_
Chibin-el-Kom	8,000	_
D * 0	1.108	_
	776	_
	5,826	_
Esneli	21,450	
Guizeh (Agrieultural School)	4,293	
Minich		
Port-Said	4,300	_
Total	100,521	
TRIBUNALS.		
	1 F	36.
Ayat and Port-Said	7,000	_
Chibin-el-Kom	3,335	_
Dessouk	1,481	_
Hehia (Mehkéme Charich)	462	_
Minich et Mehalla	3,630	_
Sedfa	1,387	_
Soliag	2,442	_
Total	19,737	

# Hospitals.

			_,	М.
Lumitics' Asylum, Cairo			15,500	
Alexandria (infectious diceases)			5,000	
Assiut			10.908	_
* 1			1,854	_
Beni-Suef, Damanhour and Fayum			12,000	_
Deni-Suel, Lamannour and Layum Hosti			25,350	_
Cairo (enlargement Kars-el-Aini Hospi	the Hosp		,	
Cairo Bacteriological Laboratory, ut			978	_
Kas-el-Aini			424	
Cairo (local vaccin, Abhassieh)			5,079	_
Chihin-el-Kom			7,500	
Minia			1.249	_
Mansourah		•••	7,500	_
Port-Said	***		4.000	_
Sohag	***	***	8,000	_
Suez	v 1 4 0 0 1			
Tanta			4,050	
Works executed by Sanitary Service	in 1903		9,000	
	Total	*** ***	118.392	_
			-	
	(7			
DISINFECTION	STATIONS			м.
			L.E.	м.
Damietta			. ( –	
Mansourah	***			
Zagazig	***		. \ 3,145	
Tanta			. / -	_
Suez			. ( –	
	Total		3,145	_
	4.476687			
SLAUGHTE	Houses.			
			h.E.	М.
Beni Suef			1,754	_
Benha			582	
Bebu		• • • •	485	_
Cairo			6,334	_
Chibin-E-Kom		• • • •	513	_
Damanhour		-1-	1.832	_
Damietta			841	_
			2,003	_
			202	_
1 m 0 9			564	_
FT 1			716	
T* 11* 1			534	_
10			838	
Carried j	orieard		17,198	

										L.E.	M.
					Forw	ard				17,198	
TF . P. T71 . 77										559	_
Kafr-El-Zayat		•••		•••						569	_
Luxor		• • •							* * *	642	
Mit Ghamr		• • •	• • •	• • •		• • •	* * *	• • •		684	
Menouf	+ * *	• • •	* * *	• • •			* * *	* * *	• • •		_
Minich	9 0 0	• • •	* * *	• • •	• • •			• • •	•••	1,635	
Mugagah				• • •	***	0 0 9		* * *		346	_
Mehallah		* * *				0 0 0				783	_
Mellaoui			***	* * *		• • •				521	_
Manfalout				• • •	• • •			***		835	_
Port-Said						* * *			* * *	1,904	_
Suez		* * *		***				• • •		1,100	_
Sohag	+ 0 *	• • •	• • •	• • •			* 1 *			673	
Senoures		• • •						4 + 8		405	_
Tuhta								• • •	*	831	_
Zifta										600	-
Reserve								***	****	5,469	_
Work execute	d on	San	itary	Sei	rvice	190	1-19	()2-1	903		
$(3 \times 5,000)$		• • •								15,000	_
(1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1						771	.1				
						Tota	11			49,759	
				2.							
		2801295		3.4	A DAMES OF			7.7			
	GOVER	DUE	ATES,	, 311	DIRE	EHS	AND	MA	RKAZ.		
					DIRU	EHS	AND	MA	RKAZ.	L.R.	М.
Port-Said (Go	vernor	ute)	•		···	EHS	AND	) MA	RKAZ.	L.R. 18,000	М.
Port-Said (Go Galioubieh (M	vernor [udirs]	ate) hou	 śr)	• • • • •							M.
Port-Suid (Go Galionbieh (M Fayum (Anne	vernor [udirs] ex to M	ate) hou Iudir	se) ieh)		4 * *	•••			***	18,000	_
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi	vernor [udirs] ox to M	nte) hou Indir	se) rich)				• • •		* * * *	18,000 1,627	_
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria,	veruor Indirs' ex to M rich) Police	ate) hous Indir  Bar	se) ieh) rabk	···			•••	0 0 0	• • •	18,000 1,627 494	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria,	vernor [udirs] ox to M rieh) Police Mohar	nte) houdir dudir Bar	se) ieh) rabks Bey	s : Q Car		0 0 0		0 0 0	• • •	18,000 1,627 494 1,000	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria.	veruor Indirs' ex to M rich) Police	nte) houdir dudir Bar	se) ieh) rabks Bey	s : Q Car		0 0 0	0 0 0		•••	18,000 1,627 494 1,000 1,783	
Port-Said (Go Galioubieh (M Fayum (Anne Keneh (Mudi Alexaudria.	vernor Indirs' v to M rieh) Police Mohar Flemin	nte) hour fudir  Bar rem ag C	se) ich) rabk: Bey	s : Q Car	uny	0 0 0			000	18,000 1,627 494 1,000 1,783 758	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria.	yernor Indirs' ex to M rich) Police Mohar Flemin Station	nte) hour fudir  Bar rem ag C	se) ich) rabk: Bey	e : Q Car	uny	0 0 0		000		18,000 1,627 494 1,000 1,783 758 2,695 710	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria.	vernor Judirs' x to M rieh) Police Mohar Flemin Station kaz	hous fudir Bar rem ag C	se) rich)  Bey nrace	carrol	uny	•••			•••	18,000 1,627 494 1,000 1,783 758 2,695 710 1,822	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria. Atf.—Police Abnub.—Mar Abonjerkas .	vernor Judirs' ex to M rieh) Police Mohar Flemiu Station kaz	hour fudir Bar rem ng C	se) rabks Bey	e : Q Car	uny				•••	18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria. " Atf.—Police Abnub.—Mar Abonjerkas . Achmoun .	vernor [udirs' x to M rieh) Police Mohar Flemiu Station kaz	hous fudir Bar rem ng C	se) rich) rabks Bey arace	e: Q Car	uny				•••	18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731	
Port-Suid (Go Galioubieh (M Fayum (Anne Keneh (Mudi Alexaudria. """ Atf.—Police Abnub.—Mar Aboujerkas . Achmoun . Badari	vernor Judirs' ox to M rich) Police Mohar Flemin Station kaz	ate) hour fudir Bar rem ag C	se) rich) rabks Bey	Carrol	uny					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 4,698 1,731 1,689	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria. """"""""""""""""""""""""""""""""""""	vernor Indirs' ox to M rich) Police Mohar Flemin Station kaz	hous fudir Bar rem ng C	se) rich) rabks Bey	Carrol	uny					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria. Atf.—Police Abnub.—Mar Abonjerkas Achmoun Badari Beba	vernor Indirs' ex to M rich) Police Mohar Flemii Station kaz	Bar Bar Company	se) rich) rabk: Bey surace	Carried	uny					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 4,698 1,731 1,689 2,034 3,572	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexaudria. ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	vernor Indirs' ex to M rieh) Police Mohar Flemii Station kaz	boundary and the state of the s	se) ich) rabks Bey antice	s: Q Carro	   					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria. Atf.—Police Abnub.—Mar Abonjerkas Achuroun Badari Beba Belbeis Baltim	vernor Judirs' ex to M rich) Police Mohar Flemin Station kaz	Barreni G. C.	se) ich) rabks Bey annee	e : Q Carr	uny					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500	
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Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria. Atf.—Police Abnub.—Mar Abonjerkas Achuroun Badari Beba Belbeis Baltim Beni-Suef Cairo.—Cara	vernor Indirs' ex to M rieh) Police Mohar Flemin Station kaz col Da	Bar Control Ending Control Ending Control Ending Control Ending Control Ending Control Ending	se) ich) rabks Bey surtee	e : Q Carriol	uny					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria. Atf.—Police Abnub.—Mar Abonjerkas Achmoun Badari Beba Belbeis Beni-Suef Cairo.—Cara	vernor Indirs' ex to M rieh) Police Mohar Flemin Station kaz eol Da Py Say	hour fudir Bar rem ag C	se) ich) rabke Bey surrece 1 Ah ds Zeua	s: Q Carr	uny					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 4,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343 617	
Port-Suid (Go Galioubieh (M Fayum (Anne Keneh (Mudi Alexaudria.  Atf.—Police Abnub.—Mar Aboujerkas . Achuroun . Badari Beba Belbeis Belbeis Baltim Beni-Suef Cairo.—Cara	eol Da Py Say E1	Bar Control Error	se) ich) rabks Bey arnec 1 Ah ds Zeua	Section 2 Carrier Carr	unay unay uncol					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343 617 656	
Port-Suid (Go Galionbieh (M Fayum (Anne Keneh (Mudi Alexandria. Atf.—Police Abnub.—Mar Abonjerkas Achmoun Badari Beba Belbeis Beni-Suef Cairo.—Cara	vernor Indirs' ex to M rieh) Police Mohar Flemin Station kaz eol Da Py Say	Bar Control Error	se) ich) rabks Bey arnec 1 Ah ds Zeua	s: Q Carr	uny neol					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 4,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343 617	
Port-Suid (Go Galioubieh (M Fayum (Anne Keneh (Mudi Alexaudria.  Atf.—Police Abnub.—Mar Aboujerkas . Achuroun . Badari Beba Belbeis Belbeis Baltim Beni-Suef Cairo.—Cara	eol Da Py Say E1	Bar Control Error	se) ich) rabks Bey arnec 1 Ah ds Zeua	:: Q Carroll	unay unay uncol					18,000 1,627 494 1,000 1,783 758 2,695 710 1,822 1,698 1,731 1,689 2,034 3,572 784 6,500 3,000 1,343 617 656	

											L.F	M.
						Foru	urd			• • •	54,164	_
Dessuk											1,891	
	• • •		• • •	• • •	***						2,329	_
Deirut	• • •	* * *	* * *	* * *	• • •						1,986	
Delingat	0 = 0	• • •		1			• • •				3,704	_
Esnu				* * *	• • •						1,701	
Etsa	•••	• • •	• • •	• • •		• • •	• • •		***		1,130	_
Facous	* * *		• • •				0 4 0	* * *			1.080	
Guirga	• • •										2,881	_
Guizeh				***							1,807	_
Kolosmu		***			• • •	• • •					1,615	_
Конезна			0.0.0	* * *			* * *	* * *	0 0 0		1,714	
Kallinh	1					• • •	• • •				2,846	_
Kom-Hama		* * *		* - 0		• • •					1,682	_
Manfalut			* * *						***		2,478	
Minin				• • •	• • •	* * *					3,347	
Nawa								* * *	***	• • •	1,751	_
Sembellawa		***					0.00		* * *		1,604	_
Sennoures !	Mark	ÇILZ.									1,748	_
Tahta	**		• • •					* * *		• • •	1,564	
Toukh	99		* * *		***		+ 4 0	* * *	* * *		1,648	_
Zefta		***						• • •				
							Tot	n1			94,706	_
					10.		1. 1					
					L	RISO	100				1 K.	M.
A.L Tuto											24,245	
Alexandria			• • •	• • •							475	_
Abouzabal	4 * *	* * *		***	• • •	***	•••				25,843	560
Beni-Suef			• • •	***		• • •	* * *				43,061	440
Cairo		***		• • •	• • •	***					35,452	_
Tanta				***							2,000	_
Toura											11.385	_
Zagazig	* * *		T)	• • •	1. 147	· · · ·				0 4 9	20,000	_
Works exe	HTRIFF!	d by	Fri	-()110-	111 17	46177						
							Tot	tal			162,462	_
							4.5		Q			
		Ce	STOR	t-Ho	USES	ANT	1 (1)	AST-	CiUA	RDS.	3 12	м.
	**	1 6									37,223	-
Alexandria	1.—1	obac	2 695	TOTH	11.	• • • •	1	(1.00			38,274	_
*1										uards	4,878	
Damierta.								• ••			730	_
Ismailia.											923	
Port-Ibral											1.865	
Port-Said												
Port-Said											2,530	
Port-Said											4,339	
Suez.—C	iston	n Ho	Hels								3,134	
Works ox	e-critt	ed by	r Cu	510BB	Ho	1404	m 19	H);;			7,500	
							T	stul			101,446	-

## QUARANTINE STATIONS.

	1. E.	М.
Alexandria.—Mex	9,118	
0.1.1.71.00	41,721	
\$ pro 108	874	
Port-Tewfik	914	
Total	51,713	_
Post Offices.		
	L.E.	М,
Alexandria.—Annex	665	_
Abou-Kébir.—Annex	388	_
Cairo.—Enlargement	14,509	_
Ebcheway	457	_
Mansurah	773	_
Port-Said	24,552	_
Total	41,341	
		-
TANZIM OFFICE.		
TANZIM OFFICE.		
Damanhour	L.E. 1,227	м.
FFI L	1,902	
		_
Solnag	3,396	
Total	6,525	_
		==
Sundries.		
	112.	М.
Annex Ministry of Justice Sundries p.c	874	_
" Sanitary Service	1,497	_
Caisse de la Dette	2,100	_
Survey Department.—Guizeh	1.057	_
School of Agriculture (dairy and stables)	2,500	_
// 1 1 1 1 / 1 / 1 / 1 / 1 / 1 / 1 / 1	1.5110	
Zoological Gardens, Guizeh (2 pavilions)	1,500	
(pavilions) (pavilions)	1,898	_
		_
, (pavilion for large mimals) , (cage for mimals)	1.898 4,000	
, (pavilion for large unimals) , (cage for unimals) Local for reproduction of plans	1.898 4,000 2,655	_
Local for reproduction of plans  Port-Said Lazaret  (pavilion for large unimals)  (cage for unimals)   Port-Said Lazaret	1,898 4,000 2,655 3,000	_
Local for reproduction of plans Port-Said Lazaret Local Photographies Have for Director of School of Modernia	1.898 4,000 2,655 3,000 581	_
Local For Director of School of Medecine	1,898 4,000 2,655 3,000 581 2,340	_
Local for reproduction of plans Port-Said Lazaret Local Photographies House for Director of School of Medecine , of Zoological Gardens	1,898 4,000 2,655 3,000 581 2,340 713	_
, (pavilion for large unimals) , (cage for unimals) Local for reproduction of plans Port-Said Lazaret Local Photographies House for Director of School of Medecine , of Zoological Gardens Museum of Society of Geography	1,898 4,000 2,655 3,000 581 2,340 713 951	_
Local for reproduction of plans Port-Said Lazaret Local Photographies House for Director of School of Medecine , of Zoological Gardens Museum of Society of Geography New Geological Museum	1,898 4,000 2,655 3,000 581 2,340 713 951 4,602	_
Local for reproduction of plans Port-Said Lazaret Local Photographies House for Director of School of Medecine , of Zoological Gardens Museum of Society of Geography New Geological Museum Firemen's Central Station, Cairo	1,898 4,000 2,655 3,000 581 2,340 713 951 4,602 18,675	_
Local for reproduction of plans Port-Said Lazaret Local Photographies House for Director of School of Medecine , of Zoological Gardens Museum of Society of Geography New Geological Museum	1,898 4,000 2,655 3,000 581 2,340 713 951 4,602	_
Local for reproduction of plans Port-Said Lazaret Local Photographies House for Director of School of Medecine , of Zoological Gardens Museum of Society of Geography New Geological Museum Firemen's Central Station, Cairo	1,898 4,000 2,655 3,000 581 2,340 713 951 4,602 18,675 6,000	_
Local for reproduction of plans Port-Said Lazaret Local Photographies House for Director of School of Modecine , of Zoological Gardens Museum of Society of Geography New Geological Museum Firemen's Central Station, Cairo New stables, Cairo	1,898 4,000 2,655 3,000 581 2,340 713 951 4,602 18,675	_

# RECAPITULATION

									1E.	м,
Large buildings, M	nseum	s and	l Cor	irts	of Ju	istic	p.	• • •	399,821	_
Schools	***			• • •					100,521	_
Tribunals							• • •	***	19,737	_
Hospitals			***						118,392	_
Desinfection Statio	ns								3,145	_
Slaughterhouses									49,759	_
Governorates, Muc									94,706	_
72.4									162,462	_
Custom-Houses un									101,446	_
Quarantine Station									51,713	_
Post-Offices								• • •	41,344	
									6,525	_
									54,943	_
Sundries			+ 8 8			* * *		• • •	UT1,/211	
			GRA	ND .	Гота	l	• • •	• • •	1,204,514	_

Appendix 6.

Isspection.	TOTAL NUMBER	TO	TAI, S	PENT ON		GRAND T	OTAL
INCERCATION.	OF BUILDINGS REPAIRED.	ORDIN		SPECI		Spen"	ι.
		LE	м.	L.E.	М.	L.E.	ML
East	92	3,771	835	3,115	-	6,886	835
West	170	5.112	369	25,467	OUO	30,579	369
Cairo Buildings	47	7.383	ĐĐĐ	7,002	(101)	14.385	000
Delta Buildings	. 18	1,407.	000	4 *	•	1,407	(1(1))
				Total	L.E.,	53.258	204

Appendix 7.

TABLE OF PRIME COST OF NEW SMALL BUILDINGS EXECUTED IN 1903.

	al military	int this.		0.0 pine 0 0 0		0,640	0.520	0.000	1	0.700
	_	Valume, par tu.c.				005	I, two	1,320	1	32
Kubirs,		netrit 100	I LEPON I	T <sub>2</sub>		1	1	1	1	1
		1K 79	I.ucs l			1	1	1	1	1
hulldings with dwarf	walls.	lat Mi	Mah-W			t	1	1	1	1
Fure	.	17C .E.	d white			1	1	1	1	
Suctorare	W	bet Wi	Tolune			1	1	1	1	
	1	dne 'K a	Princial	L. F.		1	1	1	L.CHZI	1
Verandahir.		Jernytti	Burtaon			١	1	1	3,50 3,40 32,00	-
Veral			M.Mth.			-	1	l	* 5	1
			remary.			1	-		* S	1
		albr.	Prices	1.16.		15 SKM1	E PAST	1,033	1	l
4	Surface covered,	Without verandable.	sauture.			15 K	2 5	15 E	1	
	Three fo		Prine,	4		E 45	1775	240 2.033	ı	
	- Z	Without would.	.mettari			N.	N. S.	N TE	167,00 147,00	र्ले
		Total		2		3	95	900	117,00	e.e.
		Namber of floats.				-	R. d. Ch.	e==	ı	R. d. Ch.
		PESCHIPTION OF BUILDINGS.			CAIRO.	Construction of a serting room on the 1st floor of the new addition at the Post Office	- inc	Construction of a room over the lat finer of the Chemical lab	Construction of a marquise of the upota main entence of the upota House	DELTA. Construction of a room for the lies engine at Descouk
		'aaqu	mX			-	÷+	22		45

# Appendix 8.

# MINISTRY OF JUSTICE

LIST OF MARKAMAS EL-MARKAZ EL-SHARIYAR IN UPPER EGYPT.

Mahkanna-al-Markaz El-Shariyah.	Government property or Rented.	Mahkamus-el-Markus El-Simriyah	Government property or Rented.
Embabeh (	iovernment.	El-Saf	Rented.
Ayat 1	Rented,	Guizeh	**
Beni Suef	9-0	Bebeh	**
Wasia (	overnment.	Semionres	<b>6-4</b>
Faynm 1	lented.	Etsa	a q
Minielı	99	Fachn	0.0
Мадаца	0.9	Beni-Mazar	09
Abou Korkas	91	Samalut	45
El-Wahal-el-Bahariyah	99	Manfalm	Government.
Abu Tig (	lovernment.	Mallawi	99
El-Wahal-el-Dakileh	9.0	El-Wahal-el-Khariga	9.0
Talita I	Rented.	Deirnt	Rented.
Badari	**	Assint	99
Abnub	94	Baliana	**
Sulag	4.0	Akmime	00
Gnirgueh (	Jovernment.	Dechna	Government.
Kosseir	14	Esnelı	Rented.
Keneli I	Rented.	Luxor	99
Nag Hamadi	• 9	Kous	*1
	iovernment.	Aswan	
	Rented.	Abi Hara	49
		Am-more	**

Appendix 9.

Maintenance of Town Roads from 1902 to end 1903.

Towas.	YEAR.	Water.	Lighting.	Roads and Gardens.	Sundries.	TOTALS	Вирокт.
		1., E.	1. 1. M.	1 K.	L.E.	I., E.	I., F.,
Direction Delta							
Tanta {	1902 1903	358 615	539 540	1,129 1,207	78 290	2,106) 2,653	2,500
Kafr-el-Zayat	1902 1903	37 37	186 320	571 596		795) 954)	1,000
Mehalla	1902 1903	20 20	382 388	569 578		1.018) 2.387)	1,200
Zefta	1902 1903	38 38	475 475	0.50		1,058) 1,440)	
Chébin	1902	30	412 · · · · · · · · · · · · · · · · · · ·	10101		761 711	
Menouf	{ 1902 1903	19 20	148 82	18.34		549 494	
Direction Fast							
Suez	{ 1902 1903	50 50	700 . 700 .				
Damietta	{ 1902 1903	• •	299 99 256 70			789 1,143	
Zagazig	{ 1902 1903	70	416 . 419 02	$\begin{array}{ccc} 1,21 \\ 0 & 1,33 \end{array}$	7 987 7 752		
Mansourah	{ 1902 1903		12/1/2	18		1.137	
Port-Said	{ 1902 1903		2,505 99		27	6.87	3
Mit-Ghamr	1902 1903				14	4.7	1,200
Direction Wes	1						
Damanhour .	1903	3 295		8	71 1	8 1,18	5 1,500
Benha	190	3	181 4	51 683,2	71	864,72	2 1,000

Appendix 10.

SUMS GRANTED TO LOCAL COUNCILS SINCE THEIR CHEATION IN 1891 TO 1903.

Disection Delta.	(1) (2) (1) (1) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	2,500 1,000 1,200 1,200 1,500	90000000000000000000000000000000000000	95.5				
0.5.50	2.1		9997	(MK), 1				
			3 5	997.1	0021	207188	0001	00000000000000000000000000000000000000
Direction Past.								
Zagazig       2,250       2,250         Suez.       1,877-451         Damiedta          Mit-Gunr          Mansoural	2,250 2,250 1,500 1,200 2,750	1,200	0.25.25.25.25.25.25.25.25.25.25.25.25.25.	2227 2227 2227 2227 2227 2227 2227 222	1,260 1,260 1,260 1,200 1,200 1,200	5655	300000 300000 300000000000000000000000	320000
Direction West.								
Danauhour 1,500 1,500 Benlu 1,000 1,000	1,500	1,500	1,000	1,500	1,500	1,500	1,500	1,500

Appendix 11.
Tanzim Robhsas delivered in 1902 & 1903.

	TANZIM NOKH	110-317 474444				
Yenre.	Towns.	for Buildings and Repairs.	for Occupation of the public road	for Verandalis	Totals.	Heccipta.
	Direction Delta.					LE. M.
1902 1903	Tantah	310 391	718 786	11 20	1079 1197	603 402 923 264
1902 1903	Kufr-el-Zayat	70 97	140 127	2	212 228	107 092 114 050
1902 1903	Mehalla	282 327	244 204	_	526 531	191 770 214 480
$1902 \ 1903 \ $	Zift:	113 121	74 79	=	187 200	82 785 71 700
1902 1903	('hibin	176 231	52 79	26	250 336	72 840 111 140
1902 1903	Menonf	151 218	32 67	7	190 292	60 795 192 275
	Direction East.					
1902 1903	Zagazig	264 300	149 272	23	436 603	198 810 331 685
1902 1903	Mansourah	285 331	350 294	24 21	659 646	419 394 285 234
1902 1903	Suez	93	174 149	2	269 256	121 318 122 781
1902 1903	Port-Said	286	551	103	940	362 677
1902 1903	Ismaillich	40	=	-3	43	12 460
1503 1505	Damietta	244 225	066 78	3 7	313 310	117 336 122 438
$\frac{1902}{1903}$	Mit-Gamr	{ 498 241	122 93	_	620 334	145 132 124 839
	Direction West.					
1902 1903	Damanhour	269 249	79 107	8 26	356 401	114 900 156 481
1902 1903	Rosetta	78 195	_	6 5	84 200	20 220 26 160
1903	Benha	100	85	9	194	89 728

Appendix 12.

Expropriation and Sale of Ziadet Tanzim, 1902-1903.

		E	KPBOPRIATIO	on.		ZIADETE S	nLb
Years.	Towns.	Areas.	Same jaid.	Rate of M2	Areas.	Sums received.	linte of M2
			L.E. M.	LE M.	212	1.E. N.	L.E. W.
1902 } 1903 }	Direction Delta.	51·78 59·36	155 · 014 137 · 015	3.009 2.308	303	25 • 625	0.682
1902 } 1903 }	Kafr-el-Zayat	_	_	_	_	_	_
1902 }	Mehalia Kobra	_	_	_	172 267	F40+000	0.200
1902 } 1903 }	Zifta		=	_	269 118	3:175	199
1902   1903	(hibin-el-Kom	494·14 383·03	179.866 158.331	0:364	221 26	28 · 457 14 · 578	128 257
1902 1903	Menouf	{ 28·25 —	9-079	0.321	46 88	25 · 000	
	Direction East.						
1902 1903	Zagazig	\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	68·873 141·348		69 298	58 568 220 - 968	
1902 1903	Mansourah	{ 1246 · 00 1425 · 14	225 · 00 · 443 · 423		46 127	38:350 86:19	
1902 1903	} Snez	2·80 23·32	4.94	1 0-212	23	0.00	0 0 0 5 0-379
do.	Port-Said	107:19	(Néan) 1   15•55	· .	582	48.64	
1902 1903	Damietta	183 - 60			810	101 - 24	6 0.124
1902 1903	Mit-Ghamr .	2796-10		0 0 0	158 108		v incomuu re h la Moud.
	Direction West						
190; 190;		18.0			308 608	52:00	32 0.849
190: 190:	Rosetta	51.3			111 493	3:33	
190		335*5	95 194.8	26 0 580	539 26.7	3 23 - 1	0 790640

Appendix 13.

LIGHTING AND SUNDERS.

Cost of Adminh- tration.	77.7	9 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	91 41 41 41 41 41 41 41 41 41 41 41 41 41	1
Furchasenf Zimbet Tunzim	27	2.084 2.084 50.000 14.578 25.000	9.083 229.068 30.000 108.860	95.5
Reserve	<u>.1</u>	1 1 22 1 25 1 20 1 20 1 20 1 20 1 20 1 2	24400 340956 346123 37.000	1680
Smithtion expenses por interpretation.	L.H.	0.0018384 0.0063 0.007123 0.00134	0.011 0.003 0.005 0.005	0.00456
Sanifary Budget.	1	35 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	86   8   18   18   18   18   18   18   1	150
Annuel of Dighting per interbitment.	1	0.0033 0.0125 0.03178 0.03178 0.0489	0.010 0.040 0.040 0.012 0.040 0.040 0.040	0.00122
Annual of 1981	1 E.	25557±8	25 22 28 28 28 28 28 28 28 28 28 28 28 28	308
(Total	o to	1.598 1.883 2.105 5.9636 2.344	25.00000 25.00000 25.00000 25.00000	7.6%
Number of Instant.		230 190 190 35 35	53355	<u>\$</u>
Kind of tightbug.		Petroleum.	Mineral Oil Gas	Petroleum.
Ares of read Mghted.	N.s	166137 .382 72010.215 10000 88500 68822 32601	120167 121700 27000 335038 180000 60000	SKKKI.
Towns.		Direction Delta. Tuntul	Direction East.  Sucz.  Port-Said  Zagazig.  Munsourah  Damietta	Direction West.

Appendix 14.

Water Raising Machinery.—Cost of Water, 1963,

ber	with with with with witer in the contract of t	Precentage of multaliny (1			100)		10 %	125	
Number of Inhabilants	supplied with definition with and finites water at litera at liter	ş.			57289 IOO	: ESCH CIST	130 to "/"	TO CAPE	
	41131 01	to doct two. I			1	123 103.84	4.60x)	1.65 40.000 711 76.124	
	the metre	1 2ml 2vii )			1	26.1	0.713		
or.		.lab.iT			1	13.30	S.BND 18.550 0713 14.600	- 15 T	
ER ROCE	* Break	M similar			1	10	S. Sex	368	
L. CTOMEDIS P.		. A'særkvind			1	17.31	2.040	212130.0	
COMT IN MELETINEM PER ROCK OF	'tro	three ether!			1	a. taki:	1	51515 51515 51515	
жо,)		Petroleum			1	3.20	51.5	S. S. S. S.	_
	I leve hours.	whit 'R 9			1	1-	5	무용무	
<u>ब्ल2३ भाग</u>	X sentil I H.3 for $\pm$ fill	W. HP. or			1	1:135	1-270	1000 1000	
	littes per see.	b xouldy			1	116-1	7-220	101	_
	,1247941	thi taiol'			1	J	7	535	
.80	Water Phanete In Inches.	guiduirt gmuf			1	**	•5		
	dum't lo de	oW munit	H.M.			<del>-</del>	21	17 T 17	
	* g . e dd	lord falof	1 8		0000	1,000	EX ST.	1,200	
	۰	ումերիայուն			0.525	10231 1.000	31791 L.200	14639 1,200 20705 1,500	
	Town.			Direction	Tunta	Kufr ElZayat	Mefailla	Zifta Chebim	

11) Quantité d'uni pataile 3,113,760 llies the, des Euna (2) Markine il arromage, (2) Markine il enromage, (3) Markine d'esu pajable

#### Appendix 15.

# DUTIES OF THE DISTRICT TANZIM ENGINEERS.

For P. W. D. Tauzim.—Permits, plans, contraventions, alignments, expropriation, estimates examination of insecure houses.

Technical Service.—Plans of engine installations.

Finance.—Sale of land, plans, survey and handing over.

Local Commissions.—Projects, rouds, levelling, lighting, watering, gardens, waterworks, trainways, telephones.

Sanitary.—Cemeteries, choice of survey.

#### Appendix 16.

# SOME CHARACTERISTICS OF LOCAL BRICKS

TABLE I.

RATE OF ABSORPTION OF BRICKS.

	Percent	nge of w	ater (by	volume)	absorbed	after im	mersion (	luring
CLASS OF BRICKS.	1 Minute		-	- 1	1 Hour	1	24 Hours	
Zaffrani	27.99	32.71	33.07	33.10	33.18	33, 25	34.45	
Mieli	14.16	14.74	14.97	15.15	15.46	15.79	17.87	_
Tunzim	22.12	23,40	23.49	23.57	23.83	23.93	26.87	27.39
Bircher (Ordinary)	. 17.01	26.47	30.92	32.15	32.40	32.45	33.26	33.59
(Machine)	. 6.76	12.29	15.55	19.21	24.10	26.34	27.01	27.18

TABLE II.

# ABSORPTION.

	Perce		water ab	ecry kneed	Percentage of water absorbed by weight.				
CLASS OF BRICK.	P Evpertument	s friertumi.	Mean, Mean,		> Expediment.	> Experiment,	Figurinal.	Messii.	
Zuffrani	34.80	33.54	34.45	31.26	22.66	21.85	22.89	22.47	
Mieli	17.92	16.37	17.87	17.39	10.85	9.92	10.34		
Tanzim	23.10	20.63	27.39	23.71	16.19	14.46	19.03	16.56	
Bircher (Ordinary	35.46	34.43	33.59	34.49	22.47	21.82	21.12	21.80	
(Machine)	24.42	27.70	27.18	26.43	13.33	15.12	15.76	14.74	

TABLE III.

	Weight of	Cube of	Weight of	Volume of	ABSORPTION.		
CLASS OF BRICKS,			Bricks per M <sup>3</sup> dry Kgs.	water absorbed by Ma	Percentage of Weight	Percentage of Volume.	
Zaffrani	191.87	0.125	1535	0.043	22.47	31.26	
Bircher (Ordinary)	203.58	0.128	1584.3	0.045	21.80	31.49	
(Machine)	220.83	0.121	1831.3	0.031	14.74	26.13	
Tanzim	234.75	0.164	1427	0.036	16.56	23.71	
Mieli	198.13	0.120	1651	0.021	10.37	17:39	

TABLE IV.

General Characteristics of Bricks.

	Weight of Bricks	Specific	Arson	BTION.	CRACKING LOAD.	
CLASS OF BRICKS.	per M <sup>1</sup> dry Kgs.	Gravity.	% of Volume.	96 of Weight	Kga. por Cin.	
Zaffrani	1535	2.3	34.26	22.47	13.85	
Mieli	1651	2.1	17.39	10.37	12.58	
Tunzim	1427	1.9	23.71	16.56	8.29	
Bircher (Ordinary)	1584.3	2.4	34.49	21.80	72.17	
(Machine)	1831.3	2.1	26.43	14-74	104.46	
Mursili	_	. –	_	-	29.59	

TABLE V.

RESULTS OF INDEPENDENT TESTS.

CLASS OF BRICES.	Weight of 100 Bricks dry, KRa.	Cabe of 100 Brinks M	Weight of Bricks per Mr	lis	of water 100 latel 2nd Test M <sup>2</sup>	(A.		Percent- age of would go
Zaffrani	189	0.120	1575	0.040	0.0432	0.0416	34.7	22.03
Bircher (Ordinary)	205	0,130	1577	0.045	0.047	0.(46	35.38	22.41
(Machine)	_	_	_	_	_	_	_	_
Tanzin	233	0.160	1456	0.045	0.040	0.0425	26.56	18.24
Mieli	195	0.120	1625	0.030	0.030	0.030	25	15.32

TABLE VI.
CHARACTERISTICS OF ENGLISH BRICKS.

PLASS OF BRICKS,	Weight.	Specific Convity	Absorption Percentage of Weight.	Cracking Stress.	C'rushing Stress.	REMARKS.
	Kga.			Ker. per om <sup>t</sup> .	Kgs. per cm².	
Bricks weak red	5005	_	_	38.67	_	Bankine's civil Engineering.
Bricks strong	10	2 to 2.17	_	56.25 77.34	_	Mitchell's Bulding Construction.
Brick fire	2163	-	_	119.53	_	( diffuse menority
Unburnt Bricks	_	_	_	4.02	36.21	Grant.
Common Red	1894.7	-	_	25.19	151.16	Latham.
Machine-made   Formed Red	-	-	_	86.83	124.59	Latham.
Common Stock	1843.3	_	10.5	43.78	560.37	Latham.
Farcham Reds	1901.6	_	_	36.59	113.41	Grant.
Rubbers	1605.4	_	_	4.49	50.41	Grant.
Gault		_	_	53.57	148.97	Grant.
Wire-cut	. –	-	-	29.10	149.62	Grant.
Pressed	. –	_	-	31.67	157.49	Grant.
Stafford dressed Blue		_	_	60.02	441.47	Latham.
go yo oo	. –	_	-	86.33	293.11	Latham.
. Common Blue,		_	-	50.08	150.23	Latham.
Bishops Waltham Wire						
cm	.   -	_	-	124.74	189.09	Bramwell.
Burham Wire-cut .	1671.	-	19.0	_	212.6	2
Presed	1701.3	-	19.5	-	193.7	2 -
Wire-ent White Gault	1645.		19.0	-	212-6	2

#### Appendix 17. .

Tablean de comparaison entre les prix de revient des planchers en béton armé et planchers avec solivage en bois ou en jer.

Les calculs des planchers ont été faits en prévision d'une surcharge de 300 Kgs, par mètre carré et les prix de revient faits pour une bande de 1.00 mètre de largeur et de toute la portée de la pièce.

Les prix unitaires qui ont été appliqués pour établir les prix de revient sont :

- 1° Pour plancher composé de solives en bois, faux plancher et natte (Prix de l'entreprise de l'Ecole Sanieh).
- 2° Pour plancher composé de solives en fer entrevous en briques creuses à plat et bétou de remplissage jusqu'au niveau de la semelle supérieure des solives (Prix de l'entreprise de l'Ecole de Droit).
- 3° Pour plancher en béton armé composé seulement du honrdis ét de pontres pour les grandes portées (Prix de l'entreprise de la Caserne des Pompiers).

PORTÉE	SURFACE DE		PRIX I	E REVIENT	DES PLAN	CHERS			
L. C. SP. L. L. L. S.	PLANCHER	avec solive	en tole.	nver edir	es on for.	en bêtar	nrmê.		
М.	M 2	L.E.	M,	L.E.	ж.	110.	M		
3	:}	0	762	()	832	1	500		
-1	4	1	259	1	325	2	(10)(1		
₹.	5	1	961	2	(12)}	2	500		
t°a	6	2	857	3	264	3	DOO		
7	7	:3	450	4	565	4	620		
8	s	4	672	G	192	5	280		
9	ģi.	f*	131	s	502	5	940		
10	10)	7	446	11	555	45	600		
	52	28	538	38	358	31	44()		
Prix moyer	du M²	$\frac{28.538}{52}$ 1	.E.o.549	$\frac{38.358}{52}$ I	LE.O. 738	31.440	.E.0.605		

# CAIRO VOIRIE

## CAIRO ROADS

Total area square metres .			0.00	2,831,077	
Roads well macadamised asplanted	000 000	000		So.M. 450,606 16.5% 15,562	
luferior nuceadam Earth roads	100 000	***	000	974.870 34.5% 1.390,039 49.0%	100%
	Total			2,831,077	114.
Spent in upkeep, square total at rate of 24.9 Mil Spent on asphalt roads on					12,229 17,305

83% of the streets of Cairo are not maintained at all, owing to want of funds. The public complain that, though the progressive increase of the house-tax from 1895 to 1902 amounts to 41.5%, the budget for road maintenance has only received an addition of 3.86%.

The roads budget for Alexandria in 1903, with a population of 320,000,

amounted to L.E. 30,800.

Cairo, with a population of 570,000, can with difficulty devote L.E.14,000 annually to the same object. I am not taking into consideration the incidental grant of L.E. 20,000 for asphalt.

This latter grant only suffices for approximately two kilometres out of a total length of 283 kilometres of road.

Appendices C. D. E.

111111111111111111111111111111111111111						Liebe	
First cost construction	Roads Trottoir		•••	•••	.).	84,035 11,345	ыь 905,380
Cost of annual repairs	Reads Trottoi	ra		• • •		17,235 11,865	79,100
Total cost of plant				•••		•••	15,000 999,480
Real cost annual repairs					0 0 0		79,100
Sum alloted 1904		• • •	• • •				16,000

#### TANZIM AND VOIRIE

Appendices C. D. E. I would draw special attention to the statement showing the striking disparity between the fands allotted and required for road construction and maintenance. It is interesting to note that the Ghezireh Hotel Company charge householders on their estate an annual tax of 240 P.T. for scavenging and watering only, whereas, as estimated above, an additional house-tax of L.E. 2.610 Milliemes would provide funds to construct and maintain the whole road area of Cairo.

I have, us usual, reduced to a tabular form the result of the year's work.

Denomination of 2,189 nameplates for roads and roads and numbering plates were ordered in bering of house. 3,358 house numbering plates were ordered in bering of house. They will be fixed in 1904.

Appendix A.

The Kasr-el-Nil Square and approaches and the Mariette road leading to the Museum were remodelled and considerably widened in 1903. The total cost came to L.E.1,739. Of this sum L.E. 1,000 was furnished by the Tramway Co. in consideration of a permit to lay a new line round the Mixed Tribunal and to double the track along the Mariette road.

#### RAIN DRAINS.

These have worked well. The upkeep of these drains costing L.E.735 has come as a new expense on our budget and, until a special grant is made, will cause a diminution in the area of road maintained.

The expenditure of the L.E. 735 is detailed as follows:-

Sewermen, maximum 30, minimum 11; average of	L <sub>a</sub> E <sub>4</sub>
the year 21 per day, costing, night work included	352
Masons	12
Water-eart for removing water from decandation	
mouths	148
Carts for Antions (Edisports	43
Supervision Water for drain washing cubic metres 127	98
Water for drain washing cubic metres 127	1
Various purchases. Electricity 810 kilowatts × 0,038575=	50
Electricity of Khowatts X 0,058575=	31
Total 1F	. 735

The work executed comprises:

Removal of dirty water from the drain	mouths	Lo-	
fautassés			2354
Removal of mud from the drains and mon	ilis		(107
Waler pumped			511140
THRE FOR DUMDING this WRIGE			4.7
Electricity consumed by the motor pump	*** ***	0 0 0	40 hours
			SIUKHOWaths

In the above volume of 51,140 cubic metres of water pumped are included:—

- (a) Water for washing asphalted roads ... ... 350 M³
- (c) .. ., drains... ... 127 ,.

The price of water for (a) and (b) has been paid by the Sanitary Department and (c) by Tanzim Service.

The water at the months was removed by buckets.

A project for providing a further zone in Cairo with rain drainage at an estimate cost of L.E. 115,000 was prepared in this Office and submitted to the Sanitary Department on the 28th June 1903. No decision has as yet been arrived at. I would point out that a post-ponement of this question implies the adjournment of any further extension for the asphalting of the native quarters, as streets cannot usefully be asphalted until they are drained. I am anxious that this fact should not be overlooked.

## ARAB MUSEUM.

A small garden was laid out at the south angle of this building at a cost of L.E.214 to prevent dust from rising into the Library windows.

# EGYPTIAN MUSEUM GARDEN.

The laying out of this garden was completed in 1903 for a sum of L.E. 1,093, of which L.E. 590 represents filling and supply of vegetable earth.

The water installation comprising hydrants, cast iron and lead pipes accounted for L.E. 570.

# CART SERVICE.

Fair progress has been made with the demolition and reconstruction of the old Tanzim Cart Service stables and offices.

L.E. 2,450 were spent on offices, stores, dépôts, etc.

In spite of bad foundations necessitating the use of short piles the rate per square metre for stores and offices only came to L.E. 5.431 and that for dépôts to L.E. 1.812.

#### ASPHALT STREETS.

Out of a grant of L.E.20,000, a sum of L.E.17,599 was spent on the asphalting of 15,562 square metres of street. The rate per square metre for asphalting alone, including maintenance for 20 years, is L.E. 1.

The extra 0.115 per square metre represents kerbing, kennelling, drain junctions, unforeseen work and supervision.

The cost of the best macadam, not including kerbing, etc., amounts on 20 years to L.E. 1.165 per square metre or L.E. 0.050 more than asphalt.

This represents on 20,000 square metres the area which it is proposed to asphalt annually, an economy of L.E. 1,000.

The Neuchatel Asphalt Co, have so far fulfilled their contract engagements expeditiously and loyally.

After placing every possible obstacle in the way of the contractor even going so far at to assault the workmen and defacing the freshly laid concrete, the public has hailed the accomplishment of the new roads with enthusiasm and petitions are being signed praying for considerable extensions.

I would draw special attention to the great assistance furnished by Mansfield Pasha, of the Police, and his assistants.

Without Police protection the work must have been stopped.

By the employment of a few thousand pounds on expropriation, sections of existing streets running in the same direction, but blocked by intervening buildings, could be coupled up and converted into main lines of truffic. No funds are granted for this purpose. Every year expropriation becomes more costly. I presume that in case of a severe epidemic in Cairo, the piercing of wide thoroughfares would form part of any extraordinary scheme of hygienic legislation. Under such circumstances economy could not be practised. By the expenditure of an annual sum under conditions permitting of careful estimation and leisurely bargaining, large economies could undoubtedly be effected.

# STATEMENT SHOWING ROADS ASPHALTED IN 1903.

NAME OF ROADS.										AREA.
									- -	M <sup>2</sup>
Babel-Bahr, Soi	ık-el	-Kne	hab,	Sonk-	el-Zal	at, Kl	arrat	itm.		6314:40
Bein-cl-Harat .	• •			•••		•••	•••	•••		1985:67
Darb-el-Boughd el-Khadra .	ady,	Darl	   -\ \	(nssel	ı. Chû	k-el-1	Ceban	ie, H	aret	1610'77
El-Kobeleh.		• • •	***	•••	•••		• • •	• • •		1721.18
Fouatyeli-Rouey						• • •	• • •	•••		2666:62
Sekket-el-Roney	i'.	•••		•••	• • •			***	•••	757:12
El-Borg			•••	• 1 •			• • •		***	303183
						Tot	al		•••	15561:61

# GUEZIREH GROTTO.

#### RECEIPTS.

478	Paying tickets at		• • •		050=1E. 23 020=., 129	
208	Paying tickets at Service	• • • •		 1/	- 1, 120	
109	"Abonnement" Sale of 8 ticket books			 ,, ()	200= , 1	600
7275					L.E.155	100

# Comparison of Similar month 1902-03: 21st November to 31st December.

	1903		1902	
	.N.o	Amount.	7.0	Amount.
		L.E. M.		L.E. 31.
Paying tickers in L.E.O 050	45	2 250	58	2 900
Paying tickets at 0 020	505	10 100	536	10 720
P.Tete*	14	_	17	_
Tatal	564	12 350	611	13 620







### A.—Tanzim Rokhsas delavered in 1903 & 1902.

3	For bu	ildings epairs.		upation c roads.	For ver	andahs.	TOTALS.	Receipts.
YEAR.	Cairo.	Konbbeh and Matarich	Cairo,	Koubbeh und Matarich	Cairo.	Koubbeh and Matarich		
								L.E. M.
1903	2,251	8	166		107	_	2,532	1.458 457
1902	2,181	5	123		52	_	2,361	1,023 772

### B .- Expropriation and Sale of Ziadet Tanzin.

	Exi	PROPELATIONS.		7.1	ADETS SOLD.	
YEARS.	Arens.	Same prid.	Price of M2.	Arena.	Sums received.	Price of M <sup>2</sup> .
1903	1,696.24	1,106.815	0.652	1,252.36	(123.36)	0.737
1902	1,566.30	999.452	0.638	685.47	401.528	0.586

C .- ESTIMATE COST CONSTRUCTION AND MAINTENANCE OF TOTAL ROAD AREA CAIRO.

		Total arm for which Tana m is respendible	for which responsible	4-1 <sub>6.0</sub>	Airs at	Asrm at personiti		mechips contain	nguitrang mi in	Ches of payling New A mint P.		Cost amusal maint-	nation of 2 and 3,	Oos plant	No. of Years
Parioum	114	Now Quarter co.	off town	Category			Treat		Acceptable Manufalls Acceptable	Mornifalls	Aside II.	Ottarform.	Old BINE	Macadam	to Camplifice.
0.00		Marzelatn.	Augilian)	Tealgr	Authoriting Artifling	A STATES	0	x x	4	=	=	Mannatan	Angelossii.	**	1.0
													During		
1st Cutegory	ory	[HH) (HH)	1.00 . INN		GOLDEN THE GAR	III. CAIR	182,100	111,3814	12. VI	77.5	H.N. H. Br. divi		17.50c 20 Years	17,144	2
tels.	÷	154,000	246,000	2301, 0000	×	×	×	350,000	Contain 216,000		TO.1810 2345,0x0	12.22	ξ		•
3rd	:	100,1000	07.630	107,080	×	×	×	1111,000	11. O. M.	THE THE	17,430	11,7500	ŧ	٠	
11.1		Hay, CAH	81,370	241,370	×	×	×	1160, (1811)	51.370	112 (HH)	81,370	E	1	:	4 .
-	*	HIND CHH)	650,000	1,150,000	×	х	×	Gen, CHN)	15.00,000	27и. сии	×	10,250	ī		
T.	of .	1,710,000	1.123, 1mi, 1.123, 1mi)							Ž.	111. P. C.	75.100		######################################	9
		3	4. 583,000							1	1.E. 1815, 2541				

### RECAPITULATION

19(je)	79, 100	15,000	ieni, thu	
Total cost construction	Total cost annual unintennues Sidewalks 11,305 } 79,10	Total cost plint	Total L.E. 1999, 480 189, 18	unds { b) Fire Asphalit 20,000 } L.E. 30,000
Then	T-4-eight.	T coffin		N. BFor 1994 the Bonds Budget equals

D.—ESTIMATED TAN BEQUIRED TO COVER IST COST & MAINTENANCE OF CAIRO ROADS.

		1,393		-	1,21,		2,610		1,217
	$\frac{905,880}{10}:\ 60,000=0,151$	$\frac{905,380}{10}: 65,000=$		79,100 : 600,000 = 0,132	79,100 : 00,000 ==	0.283		2210	
		0 0		:	:	:	0 n 0		:
6140,000	ф 0 0	0 0		* *	*	*	*		0 0 0 0 0 0
A.—Population 66 B.—Approximate number of houses	A.—Annual construction charge per head population	B.—Annual construction charge per house	ANNTAL MAINTENANCE CHARGE.	.1.—Per hend population	$B_s$ —Per house	Total per head	Total per house	f 10 years the charge will be reduced to:-	A.—Per head

In London and Paris these charges amount to approx. : 0,450 per head and per minum.

	1								PAVED B	OADS					Total nren		
		Lin	e Stove R	OADS		SURDIV	BASALT		ROADS	A	Rende its	mproord	& " Brhjast	" Asphalt.	of Renda	Total	Total area
Years.	Rad Roids old eystem.	New li	Newly made.	touds.	Totals of Rouds in lad macadam.	Bad Reads old system recon- structed In	Previously In outh recon- structed in basalt		Newly made in lensalt.	Total_	Previously In macadate and recon- structed In cont- pressed neplicit.	Previously in earth and recon- structed in com- pressed asplant.	In asphalt com- prossed brigaettes	Total.	in different systems of paying.	of earth Rouls.	of Chiro Ronds,
			111	10		VII	VII		V111	17.	Z	X1	ZII	X111	XIV	XV	XVI
To end of December 1902					1,019,160,84				_	374,692,73	_	-	6,482,90	6,482 (a)	1,4×n),880,87	1,123,187,65	2,523,523,22
In 1903	778.115.28	2577.23 to deduct from col. XV	6,939.94	9,317, 19	-	\$1,507,02	117,49 to deduct from col. XV.		19,000,00	95,491,51		13,953,61 to deduct from col, XV.	_	13,161,61	37,564,32	16,678,38	_
Deduct Roads in briquettes reconstructed In basalt	_	_	_	_	**************************************	_	_	r	-	_	_	_	2,4(0,10)	_	-	-	-
Add newly made Roads (Col. III and VIII to total area of Caire Roads		-	_		*******	_	_	ı	_	_			_			_	50/8%3-84
Total to end of December 1903	. 778,143.00	S9.231.00	80,493,00	169,727.00	947,873,00	155,289,00	1 117.44		18,970,00	470,387,00	-	13,953.1H)	1,082.00	19,643.00	1,437,663.00	1,496,309,00	2,544,418,10
Percentage	% . 31.1	% 6.2	96 5.6	% 11.8	% 115.11	% 31.7	% n,01		96	96	0,1	1.0	0,3	1.1	7(4)		
				_	-	_	_		_		_	_	_	-	96 50,5	96 10.7i	96 100
				1.	1	1		1									

F.-REPAIRS BY HAND-LAROUR.

	Arra		Material.	rin).		Labourers	ייהונים.	fulka fun	Sakkas nud fantasa water earders	Curta.	F. 82.	Total
Year	rymired	Stone.	Sand.	Waler.	Sum.	Dayr.	Sten.	Days.	Sum.	Thay p.	S.	
H.	248,052	7.917	2.134	2,494	1,118	12,545	859	2,887	126	3,127	171	2,338
206	245,748	8,120	081.2	2,546	***	12,915	619	2,812	165	3,574	I GF	2,622
		008'01	00									

1903.	square metro  ad per cubic metro of stone  2.134: 7.317= 0.270 2.134: 7.317= 0.270 2.134: 7.317= 0.270 2.134: 7.317= 0.270 2.134: 7.317= 0.270 2.134: 7.317= 0.270 2.134: 7.317= 0.270 2.134: 7.317= 0.270 2.134: 7.317= 0.270 2.134: 7.317= 0.270 2.134: 7.317= 0.210 2.134: 7.317= 7.317= 7.317= 7.317= 7.317= 7.317= 7.317=
	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	stone stone
,	stone stone stone stone stone stone
RECAIRS THE HAMP-LAHOUR.	of sand per cubic metro of stone  of sand per cubic metro of stone  ther used per cubic metro repaired  ter repaired per day of workman  transported per day of cart  rt per journey  of materials per square metro repaired  per labourer  per sakkas and lantass  per cart
141	of sand per eubic metre of the rased per eubic metre of the rased per equice metre of the rased per square metre of the ransported per day of fauturation per journey the ransported per day of card from the ransported per square metroper sakkas and fautuss per cart
HAD	to feer square metre internsed per cubic metre unter the last per cubic metre of the result per square metre repaired per day of faure per journey of materials per square per labourer reer sakkas and fantass per cart
12.4	and the state of t
PAIR	The state of the s
=======================================	
	ne la constant la
	rition orthon of w of w surf ents of e
	1. Depth stone per square metro

G.-I'ERCENTAGE TABLE.

	Maturini,		LABOTTE	опи.		
1	ennel, weter	Nen S	Sukkun R Pantana Sk	tarts %	Total	her my.
	17-8 50-1	51 51 55 X	63	18:0	25. 19-91	0.0094 0.0107

H.-STEAM ROLLER REPAIRS.

Torai	TERRITE VERNE	950	Z Z
Roller.	.v.	37.	108
Seem Roller.	Duye.	5	92
Chrts.	r.	1.81	7
Ch	Itays.	1,0815	51.5
Funtaes.	Sum.	37	100
l'an	Days.	38	115
Labour.	Anna.	37	1.0
Labo	Bloys.	2017	
	kum.	513	8
riul.	Wafer.	% X 55.	<u> </u>
Material.	Sand.	386	565
	Ntolle,	3,022	21
Beauding	13 1 1023.	26.170	31.180
	YEAR	1903	1902

Proportion of sand per cubic metre of stone   186   3.022   0.128   186   3.022   0.128   186   3.022   0.128   186   3.022   0.128   186   3.022   0.128   186   3.022   0.128   186   3.022   0.128   186   18	Teaco	0:1:0		2000				710.2	15000	0.00351	0.058
20 20 20 20 20 20 20 20 20 20 20 20 20 2	01140	5158	C-23:11	130.0	954	135.53		-	377.86	(1.0036	0.032
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	26,170=	=77075	3.022=	26,170=	2,765=	SS	1,005=	6.782 ==	= 0.1	26,170=	26,170=
				ZZ.	26.170:	26,170;		21	26,170;	=======================================	9693
				Tabe of water used per square metre repaired	dean surface required per day of workman	11.11	dean only trunsported per day of cart	journey	Heal per	111	E

## J.-BASALT REPAIRS.

	Ma Amount.	1R. 5.220 108 3,883	
dre Inc	per Ma	9.889 10.708	
Kilometre mus	per Mr	0.886	1992. 0.032 0.130 0.434 0.040 7.50 7.50 3.457 3.457 3.457 3.457 3.457 3.457 0.0046 0.0046
Stein riller.	Sam,	692 558	
Strain	Jhyx.	25.5	0.052 0.0112 0.029 1272 1272 2723 2723 2723 0.000 0.0000
rta	Smi.	765	14,517= 0.08 14,517= 0.01 14,517= 0.03 21,555= 0.03 21,555= 0.03 5,173= 3.12 6,282= 3.82 565=304.08 71,863= 0.00
Curta	Elias No	3,213	
nes	Zene.	3 E	
Fantası	Daysta	888	a stone
1	.Kum,	1.55 E.S. (1.55 E.S. (	gation per M <sup>a</sup> of stone stone y of workmun. y of fantass y of cart of steam roller
Men	I haye.	21,555 16,052	101451 1
	Sugn.	L.R. 1.852	stone, per M*
rinl	Water.	6,691 4,856	no, per water usa water usa face repa face water o fransp price oll
Material	Binding.	1,735 1,295	Depth sto Proportio Cubs of v Cubs of v Nean sur Mean sur Lond of c Mean surd Mean cub
	Stone:	9,836	Lugariant and L
	repairel	171,803	
TH.	YEA	1903	

# K.-Percentage Table.

	the Ma	0.0304
	Steam redier	diplication of the control of the co
	Tetal %	STS
ABOUL	Carts 96	14.7 10.8
tiatt	Pantnas R	
	Men. 76	2012
Mukerini.	Handlog %	6.27
	YEAR	1903

L.—ROADS RECONSTRUCTED IN BASALT.

1	,971	Total expenditu	1,766	4,052	
	liour.	ck to q	20°	90 90 90 90 90 90 90 90 90 90 90 90 90 9	
	Tons Kilom.	Per Me di rend,	1.1	1.254	
	ler.	Amount	55	400	
	Raffer.	segnil.	5	30 55 71	
	#39MI	formy Yabitud singer bun	37	172	2002 0-151 0-103 0
1		tanom/.	81.5	74 8+ 8-	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
	Inpute and	.styaCl	10 10 10 10 10	11.562	0-136 0-141 0-141 0-141 0-141 0-148 0-188 0-188 0-188 0-188 0-188 0-0128 0-0128 0-0128 0-0128 0-0128
		Janoark.	#5 20	=======================================	
	Wnter,	(app.)	m,	3,637	11812 10,219 10,219 10,219 10,2813 10,2813 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897 11,897
	Paninsa.	.tanounf.	31	8	1,728 1,728 1,728 1,316 1,316 1,316 1,023 1,023 1,175 1,023 1,175
	Parit	.FlatI.	10 20 10	90 10 10	
		Эшосшү	1,023	2	* * * * * * * * * * * * * * * * * * * *
	urta.	Days.	100 E	4.237	
	ned by	Toml.	13,61	10,715	
	Work performed by carte.	and stone	52 20 20 20 20 20 20 20 20 20 20 20 20 20	(31	of faute
	Work	Marching.  Sarah or Brank or B	1,759	1.711	nding per M <sup>2</sup> of ata and per M <sup>2</sup> of ata relay of lahourar fervel per day of fa ported fuller hay fuller hay fuller and water faintee and water faintee and water fuller frider
		ilineall.	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1011	refton of blading pee M of water used per M² of water used per M² ourface per day of lais aurface watered per di cube transported surface rolled per day cost price material per , carte fantese and , carte fantese and , carte mani cost price
		Amount.	25.5	1.612	one per on of bloom of bloom of bloom on the per on one per on
	rinl.	.gnibni8	2.5.5	1.741	Perdit stone per M <sup>2</sup>
	Material	Old stone.	314	121	- H H + 4 4 4 4 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		Hanafi	- 18.67 - 18.11	7.731 8.839	
		Aiva	H1,887	888 870 871 773 773 773	· Librard other
		Y.EAR.	I'wil	1007	41.

N .- NEW ROADS ROLLED BY STRAM ROLLER.

- Jenny	
-	I. WAINT. AUMILIA.
250,1 574,	221.1
1224	142 9,221
	1
oluthe doub	Men detth stone her square metre
d per entire	Propertion of sund per cubic metre of stone
d per eulig	The of water used per cubic metre of stome
al per squa	has to anomalied her rank to with
day of won	surface per day of workman
ered per d	surface wittered per day of limina
orted per	Mean cube transported per day of cart
ourney	S. Logh of eart per journey
rel per day	surface rolled per day of seem roller
er roller	Menn cost price per roller
Cond lifted the Editiel's Illivities	

P.—LEUNLLING OF EARTH ROADS AND FOOTPATHS.

	INER	Lavelling.	Workin	Working days.	Luxa	Pays curta.	Days watering by lumb.	ng by hand.	Cube a	Cube of worth.	Ame	Amounts.
YEAR	Ronle	Fuorgathe.	Rounds.	Footpullis.	Regeda.	Footpullia.	Reads.	Pentiutin.	Brught.	Transported.	Ponds.	Footpaths.
1903	124,022	65,095	1.275	***	1-	113	56	Ξ	5,15	3,28	798	<del>*</del>
	189,117	117	-	1,50%	3	666	99	0.000	5.413	***	-	135
1902	305,200	27669	7.00	733	7.	181	2	t=	388	1,327	141	<b>93.</b>
	375	375,217		1,306	36	866	<b>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</b>	500	4,6	4,695	•0	534
	3333333 33 333333333333333333333333333	(a) Cost price, levelling road- (b) footp: (c) Area levelled per day and (d) per fantass (f) per fantass (f) (g) Average cube carted per c (h) To deduct from total sum sakka and fantass (i) Average pay of workman (k) Cube detritus removed	est price, levelling rotes levelling rotes est levelled per fanta erage cube carted per dodnet from total si sukka and fantass cerage pay of working detritus removed	ids, sq tpaths and mu ss and r day or an	nare metres footpardis sakka, road footp	aths safe footpuths	3,284 2,402 65,095; 14,694; 5,413; 3,413; 3,284.		922= 0°0000 955= 0°0000 275= 90°18 323=201°53 56=262°39 10=868°50 666= 8°128 97=338 97=338 129= 1°155	0.0014 0.0013 85-56 91-75 557-37 558-28 -1-704 383 0.089 3-959	п	

### Q.—REPAIRS OF KERBS.

		Kerlst.			Ma	teria	4			Lkilly 1	abour.		Un	ria.	
YEAR.	Total length.	Tech s mith.	2Um.	Lime.	Sand.	Hours and Fruent.	Water.	Num.	Massu.	Plum-cufft.	Labrum ra,	Sum,	Ibayu.	Setam,	Total.
1903	7.592	976 568	174	4	34	o-L	,,	2	207	207	633	118	87	13	287
1902	-	1,627	239	->	32	1	8	(i	327	319	755	119	7	1	365
	13.	162													
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### S.-QUARRIES.

MATERIAL.	Tourah and Ohl Catro.	Abbassich.	Abou Zanbal.	Total.	Sand, Abbassieh.
	711	Mi	Pf.	Мг	M1
1903. Road metal and sand	3,197	8,624	21,827	33,648	12,220
1902	2,695	7,512	16,278	26,515	8,010

### NEW BRIDGES ACROSS THE NILE

By your orders a very rough estimate of a bridge across the Nile had been prepared by M. Reboul in 1902.

During your absence in the Sudan Sir Eldon Gorst requested me

to complete this project.

The river section chosen was approved by the Inspector General of Irrigation as fulfilling the conditions of a permanent and settled direction of flow.

A sketch showing the position of the main and subsidiary bridges is attached.

The work of triangulation and survey necessary for measuring the areas to be expropriated was begun in April and May. Soundings of the main river and Roda branch were taken at the same time.

The specification was based on that in use at the Railway Department, but considerable modifications were introduced. We are indebted to M. Husson, of the Railway Department, and M. Holt, Vice Principal of the Polytechnic School, for advice and assistance. The entire specification was translated into English introducing English standard weights measures. The French original was finally submitted to Mr. de Rocca Serra, and the English to M. Brunyate. The complete classification of clauses is due to M. Brunyate. Mr. Clifton concluded all preliminaries after my departure for Europe.

The whole of the documents were approved by you on the 7th July and tenders invited in the Official Journal on the 21st of the same month. Copies of the specification were sent to France, England, United States of America, Austria, Belgium, Switzerland, Italy and

Germany.

February 1st, 1904 was fixed as the latest date for sending in offers.

A preliminary project showing proposed type of bridge was prepared by M. Zarzecki, of Mr. Rebonl's Office. This project was brought to a stage of completion which enabled a close estimate of the probable cost of the bridge to be prepared.

Owing to the skill and energy of Mr. Reboul and the assistance of Abdel Halim Pasha, Director General of Wakfs, the usually interminable negociations for transfer of the land required for roads were brought to a successful termination in about six months.

The mean price paid per acre was L.E. 300.

The following data were taken as a basis for the preparation of the project:

Waterway ,	Main Roda	Nile R.L. branch	21.13=			
Maximum f	tool.	Balmen.		Total		6258

Smaller bridges.		Main New bridge.	Kasr-el-Nil.
83 Old Cairo} 67 Kasr-el-Aini}	R.L. Road way Bottom boom Clear H. bottom boom above H.F.L.  Length bridge M. Opening span R.L. bed now	1.07 535	23.80 22.20 1.07 406 one of 23.73 +1

The original estimate was as follows:-

### Main bridge steel.

Length.	Width.	Arm.	Weight St. M.	Tone.
(535×	20)=	10700×	340=	3638
Steel 3638 T	ons × L.E.17.5		L.E.	. 63,66

### Small bridges steel.

Length.	Widt	h.		Ares	١.			Kg.
(83+67)×	15			2250	×			310
Tons 765×L.E.1							1.E.	13,388
Piers and abutm	ents		•••			0	0:0	12,000
351 711							L.E.	149,05;
Main bridge								
$M^2 10700 \times L.E.$	1.5						LE.	16.050
Small bridge	es as above.							
M <sup>2</sup> 2250 × L.E.							1 13	11 1100
	4 4 4 7 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		*** ***	* * *	* * *		L.E.	3,375
7							L.E.	168,478
Filling for road	from L.L.	. 18 to 2	1:50=				ab	11,200
Expropriation Macadam and k			** ***				8.9	17,00c
Retaining walls			• • • • • •	* * *	* * *	0.01	4.4	7,892
Staff	••• ••• ••		•••	• • •	* * *	0.04	0.0	558
Unforeseen				• • •			99	4,600
							44	20,272

The revised estimate reduces the amount for expropriation by L.E.8,812. The value of the bridge proper was increased by a similar amount, that is to L.E.177,290.

The R.L. of the lower boom of the main bridge girders is fixed at 2250 or M. 1.07 above R.L. 21.13 which is assumed as the H.F.L. at Roda.

The crest of the avenues of Roda island which will be about  $2^{-1}/_{2}$  kilom, in length is fixed at 21.50, an average height of 3.50 above the present level.

It is proposed to give these avenues a width of 25 metres.

The work of the following engineers attached to Mr. Reboul's Office merits special mention:

Mr. Zarzecki.

- .. Schoechlin.
- ., Ricordi
- .. Ahmet Omar.



### CART SERVICE

### ESTABLISHMENT.

The Cart Service commenced the year with an establishment of 118 animals and finished with 119—an increase of 1 mule.

II mules were purchased through the Veterinary Department to replace the wastage which was as follows:—

### HEALTH.

The daily percentage of animals sick and under treatment was 2.8 of which 1.3 was due to accidents during work. These figures are even more satisfactory than those of 1902.

### TRANSPORT.

The installation of a Decauville line at the Abbassich quarries has greatly facilitated transport and prevented the overdriving of mules.

The great distance of the stone and sand quarries from the city and consequent higher rate of transport is a considerable factor in increasing the cost of the making and upkeep of the roads.

After another year's experience of the relative merits of the large double-wagon and small single eart for transporting stone and sand in Cairo, the conclusion we have arrived at gives the preference to the small carts.

### Cost.

The average daily cost of P.T. 14 per animal, including cart, driver stabling repairs, etc., etc., has been maintained against the outside charges of 23 to 25 P.T.

### SHOEING.

The system introduced from the commencement of 1903 of the Service shocing its own animals has given unqualified satisfaction.

The monthly cost of shoeing, including wages, material, depreciation of tools, etc. worked out at P.T. 5 per mimal, or 120°/, cheaper than in 1902, when we paid the Veterinary Department 11 P.T. per mimal.

The Service has gained most from the fact that the shoeing is now done after the day's work, thus permitting the animals to go straight to work in the mornings; whereas formerly, the best part of the working day was lost owing to the animals being shod in the mornings. Each animal has its special day in the month for shoeing and on that day whether the old shoes are good or not the animal's feet are trimmed and new shoes are fitted.

As a result there is not a mule in the Service with an unsound foot.

### REPAIRS.

After exercising the strictest economy it has been found that for the maintenance of earts and harness in a condition creditable to a Government Service the yearly repairs in perpetuity would cost as follows:—

Carts L.E. 4.430 Milliemes or 30 to  $40^{\circ}/_{\circ}$  of cost price Harness , 1.500 , or 25 to  $30^{\circ}/_{\circ}$  . . .

The wear and tear on a stone eart is of course heavier than that on any other.

### RECEIPTS.

The receipts for work done, stores supplied, animals hired, etc., to outside Services amounted to L.E. 1,178.

### ESTABLISHMENT.

As stated in 1902, the number of animals now in the Service is not sufficient to transport all the material necessary for road-making and repairs and, in consequence, a portion of the transport is done by outside contractors at a price from 30 to 40°/o higher than it could be done by the Service Carts.

At least 20 more animals are necessary. The initial cost would be about (25\geq 20)=L.E. 500, and the yearly cost of maintenance would be L.E. 1.000.

### STABLING.

There is only proper stabling accommodation for 60, or half of the available animals. We are obliged to keep the remaining animals in the open without shelter. The animals are also too closely packed and there are frequent accidents to syces in consequence. Stables are being built out of current funds, that is by degrees.

### STAFF.

Mr. Pothecary, the Stablemaster, merits high commendation for the excellent way in which he carries out his duties.

COMPARI	SON OF	COST OF	FORAGE:	5 YEARS.
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FORAGE.	Per ton. 1899-1900	Per 100 1900-1901	Per ton. 1901-1902	Per 100. 1902-1903	Per 10n. 1903-1904	
	1.,E. M.	1E. M.	L.H. M.	L.E. M.	LE. M.	
Beans	5 402	6 360	0.087	6 717	6 855	
Barley	5 079	5 850	5 390	5 807	5 928	
Tibbin	1 642	2 370	1 896	1 463	2 320	
Brun	3 898	4 000	4 320	1 783	4 676	

% OF YEARLY INOREASE ON COMPARISON WITH 1899-1900.

1	)'er lon. 1899-1900	l'er ton. 1900-1901	Per ton. 1901-1902	l'er ton, 1902-1903	For 100, 1908-1901	
FORAGE.	A	Increase on A	Increase on	Increase on A	Increase on	
	1K. M.	%	96,	%	96	
Beans	5.402	17.7	12+6	24:3	26.8	
Barley	5,069	15:4	6.3	14.5	16:9	
Tibbin	1.612	11.2	15:4	19:5	41.2	
Bran	3.898	2.6	10.8	22.7	2()•()	

### PUBLIC LIGHTING, 1903.

### BUDGET.

No addition was made to the Budget for public lighting during 1903 and consequently there has been no increase in the number of lamps.

### REQUIREMENTS.

As stated in last year's report 6,500 more lamps are urgently required. The approximate annual cost at existing rate would be L.E. 43,500.

### INCANDESCENT LIGHTING.

As forecast in 1902 the Gas Company have consented to introduce incandescent burners at their own expense for public lighting to replace the old flat-flame burners. As with this burner an intensity equivalent to or higher than the contract minimum can be produced by the consumption of 80 litres of gas the Company can set an economy of (140—80)=60 litres per lamp against the higher cost represented by wear and tear of mantles. The Company probably gain about 1.E. 3,000 per annum by this change.

The work of changing the burners commenced in October, and at the end of the year about 500 lamps were incandescent.

There can be no question as to the result; it is very satisfactory and is a great advance on the old system.

### FINES.

The fines levied on the Gas Company during 1903 for lamps giving defective light show a decrease of about 50%, on 1902. This is due in part to the greater attention given to repairs, &c., but mainly to the improvement in the quality of gas supplied since the introduction of a testing laboratory under the very able guidance of Mr. Lucas. Heavy fines (L.E. 441) were inflicted on the Company for bad quality gas.

A comparison of the number of lamps reported as defective is interesting in 1902 and 1903.

	lamps extinguished.	Lamps giving less than standard flame.
1902	586	43,800
1903	512	10,417
Decrease	74 or 125%	33,383 or 76%

The rules at present in force are as follows :-

- 1. For a lamp found extinguished a fine is at once inflieted.
- 2. For a lamp giving less than the standard flame it is reported to the Company and if on the following night it is still defective a fine is inflicted for both nights.

### LUNAR PERIOD.

Under article 16 of the contract one fifth of the total lamps are unlit during the lunar period, or 10 nights in each month. Of course the Company receive no payment for these lamps.

Various complaints have been received with regard to this regulation, and public lighting would be distinctly improved if, during at least 5 months (October to February), the above quoted article could be suspended. This measure would entail an extra expenditure of L.E.135 monthly, or for the 5 months L.E. 675. As the Service has no reserve fund a special grant would be required from the Finance.

The average rate of additional lamps installed would also be augmented from L.E. 6,701 Milliemes per annum to L.E. 6.925 Milliemes per annum each.

### STAFF.

Mr. Mégalogéni has carried out his duties in a very efficient manner.

### GAS TESTING

### and introduction of electric public lighting.

### FINES

The increase of fines consequent on the introduction of scientific testing initiated by Mr. Lucas evidently created suspicion in the minds of the Cairo representatives of the Gas Company. They impugned the accuracy of Mr. Lucas' tests and asked permission to bring from Paris a gas expert to check our apparatus and methods. This permission was at once granted. In due course M. Conderchon, an expert of repute, arrived. His report and Mr. Lucas' reply are attached. It is evident from a perusal of the two that the accuracy of Mr. Lucas' methods is fully established.

The vexed question of the interpretation of certain clauses in the gas contract has again been raised. Startling anomalies at present obtain in Cairo.

We may accept as an axiom that gas is cheaper than electricity.

In Cairo a gas lamp of 12 c.p. costs per annum L.E.6.701.

In Helwan and other towns of Egypt an electric lamp of 20 c.p. costs from L.E.2·25 to L.E.3 per annum.

In contradistinction to accepted practice electricity in Cairo would, therefore, appear to be much cheaper than gas.

We have asked the Company, either to reduce the price of gas to say 260 P.T. per lamp, or to indroduce public electric lighting at a rate similar to that charged by Concessionnaires in Egypt.

They have refused both requests.

A scheme carefully worked out by Mr. Jacot, Government electrician, proves that by erecting and working its own station Government could furnish electric lighting at L.E.2,60 per lamp of 32 c.p. on the 6,000 lamps required; this equals a saving of L.E.4·101 per lamp and per annum compared to the present price.

### REPORT ON THE GAS TESTING LABORATORY FOR 1903.

At the end of January last a complete equipment of modern French gas testing apparatus, such as is used at the present time in the Paris gas testing stations, was received and at the beginning of April an efficient control of the Cairo gas supply for parity, pressure, and illuminating power was begun.

### PURITY.

The only standard for purity recognized in France and demanded by the Cairo contract is that the gas shall be entirely free from sulphuretted hydrogen.

This impurity has, however, been found present on three occasions and each time the Company have been fined 50 frames.

### PRESSURE.

The contract requirements for pressure, namely that it shall not fall below 15 millimetres during the hours of public lighting, are very inadequate, especially in view of the increased use of gas for heating purposes. Except on several occasions when the pressure has momentarily fallen to zero, doubtless due to shutting off the gas in connection with repairs to the mains, the pressure has always been above that demanded.

The mean pressure between sunrise and sunset is about 30 millimetres, and between sunset and sunrise about 25 millimetres, while the lowest pressure recorded (excepting on the several occasions mentioned) was 18.5 millimetres.

### ILLUMINATING POWER.

When first tested the illuminating power was found to be considerably below the contract requirements, on one occasion falling as much as 34°/<sub>o</sub> below the standard, while the mean for the first month was 19.5°/<sub>o</sub> too low. Gradually, however, the illuminating power has improved, and since August it has invariably been better than the contract demands.

Since the Government are not required to pay for an illuminating power not supplied, varying sums amounting in all to L.E.435.638 Milliemes were deducted from the Company's invoices whenever the mean illuminating power for the month was deficient, the invoices being made out on the assumption that the illuminating power is always according to the contract.

The following table summarizes the various results obtained:-

Months.	PURITY. No. of times impure.	Fines for impurity.	Paessune Minimum.	1LLUMINATING POWER. Deviation from contract.	Fines for deficient illuminating Power.
		1E. M.	Millimetree		L.E. M.
April	_	_	227)	19:5% below.	No deduction made.
May	_	_	18:5	6496	111 530
	_	_	23:0	6:1%	92 604
July	_	_	21%	Hr3%	158 189
August	_	_	19:0	4:2%	73 315
September	_	_	21.0	03% above.	_
October	1	1 928	2170	3:19	_
November	. 1	1 928	Ther	1.1%	_
December	. 1	1 928	50.0	311%	
Total	. 3	5 784		_	435 638

It will be seen, therefore, that the direct result of the regular and systematic testing of the gas supply has been an increase of over 20% in the illuminating power and an infliction of penalities amounting in all to over L.E. 441.

### RAPPORT DE M. COUDERCHON

SUR

### L'INSTALLATION DU BUREAU D'ESSAIS PHOTOMÈTRIQUES AU MINISTÈRE DES TRAVAUX PUBLICS, AU CAIRE.

L'appareil photométrique installé dans un local dépendant du Ministère des Travaux publics, est indentique à ceux en usage dans les bureaux d'essais de la ville de Paris.

La balance a été construite par Deleuil ; le bec Bengel, monté sur chandelier, est alimenté par un tube rigide métallique reliant la sortie du compteur au chandelier. La balance et le chandelier sont supportés par un bâti en fonte.

(1) L'extrémité du tube conique de la lunette a deux centimètres de diamètre.

Le local est spacieux et très bien ventilé; une hotte en tôle avec tuyan de dégagement sur l'extérieur est placée au-dessus des brûlures, dans les conditions règlementaires.

(2) Déjectuosités constatées dans les appareils.— Le plateau de l'étrier de la balance, sur lequel repose la lampe pendant les essais, est de 6 millimètres plus grand dans le sens de son diamètre que le bord extérieur du fond de la lampe, de sorte que la lampe joue dans l'étrier; si donc cette lampe n'est pas parfaitement centrée sur l'étrier, elle perd su verticalité et incline soit en avant soit en arrière du plan parallèle au disque photométrique passant par le centre du bec Bengel.

La flamme de la lampe Carcel peut dévier ainsi de 2 centimètres environ soit en avant soit en arrière et sa distance au photomètre se trouve être de 0<sup>m</sup>98 à 1<sup>m</sup>02.

Le bec Bengel étant à 1<sup>m</sup>00, l'erreur commise de ce fait peut aller jusqu'à 4 %.

A plusieurs reprises, dans nos visites à la chambre noire du département, nous avons constaté cette position anormale de la lampe et nous en avons fait l'observation à M. Lucas, chef du Laboratoire et à M. Samman, son aide.

(3) Bec Bengel. — L'instruction pratique de Dumas et Reguault, décrivant la nature et les dimensions des appareils photométriques, fixe

h 16 de millimètre le diamètre moyen des trons du bec Bengel. Or, nons avons constaté au moyen de notre aignille-jauge, que les trous du bec Bengel en service à la chambre noire du Ministère des Travanx publics, n'avaient que 16 de millimètre de diamètre, en moyenne.

D'antre part, le diamètre du conrant d'air intérienr du bec Bengel doit être de 9 millimètres; or, dans le bec Bengel que nons nyons vérifié, ce diamètre est de 9 millimètres dans la hanteur du tube en porcelaine, unis il n'est que de 6 à 7 millimètres dans la hanteur de la partie métallique. L'air d'alimentation intérieure de la flamme n'est donc pas suffismt.

Ces deux défectnosités contribuent à rendre la flamme moins éclairante, le gaz brûlant dans de manyaises conditions.

Nous estimons à 2% l'erreur commise de ce fait au détriment du pouvoir éclairant.

(4) Compteur d'abonné. — Le gaz, avant d'arriver aux appareils photométriques, passe par un compteur ordinaire d'abonné de dix bees de capacité. Il y a lieu de supprimer ce compteur qui n'est d'aucune utilité, la Compagnie devant fournir gratuitement au Gouvernement le gaz consomné par le laboratoire photométrique.

La benzine est très soluble dans l'eau; une partie de celle contenue dans le gaz destiné aux essais pent donc se dissoudre dans l'eau du compteur et cela un préjudice du pouvoir éclairant du gaz. Le gaz doit venir directement de la conduite de la rue au compteur photométrique, sans passer par un compteur intermédiaire.

(5) Vérification de l'étanchéité des appareils. — La vérification de l'étanchéité des appareils, lors de la vérification du comptent se fait jusqu'an robinet du chandelier du bec Bengel; nons croyons devoir faire renurquer que la recherche des fuites doit se porter jusqu'an bec Bengel même, car il pent exister une fuite, soit au raccord du manomètre, soit au raccord du bec Bengel; le bec Bengel lui-même peut fuir s'il se produit une fissure dans le tubé en porcelaine, comme cela arrive quelquefois.

Nous avons indiqué à M. Lucas, le moyen de faire cette recherche de fuite, en obturant les trous du bec Bengel avec la panne de la main et en ouvrant le robinet du chandelier pour établir la pression jusqu'au bec.

(6) Nombre d'essais à effectuer dans la soirée. — Dans la méthode employée à Paris pour la vérification du pouvoir éclairant du gaz, il est spécifié que les essais seront effectués de huit heures à onze heures du

soir, c'est-à-dire au moment du plein éclairage, que les expérimentateurs feront trois essais à une demi-heure d'intervalle, et que le titre du gaz sera établi en prenant la moyenne des trois essais.

- (7) Or, nous avons remarqué, en examinant les rapports journaliers des essuis, que lorsque dans un essai la consommation de l'huile est en dehors des limites de 38 à 46 grammes à l'heure, cet essai est annulé, et qu'ainsi la moyenne est calculée sur deux essais seulement; il pourrait même u'y avoir qu'un seul essai valable si la consommation de l'huile était normale dans deux essais. Nous croyons qu'il y a dans cette manière de procéder, une errenr d'interprétation de l'instruction de Dumas et Regnault, et nous estimons que la moyenne des essais d'une soirée ne peut être établie que sur trois essais. Il suffit pour cela, lorsqu'un essai doit être annulé pour consommation anormale d'huile, de le recommencer en modifiant le régime de la lampe.
- (8) Température du laboratoire. Les rapports journaliers des essais indiquent que la température dans le local on sont effectués les essais atteint généralement 20 à 23°, et jusqu'à 30°, dans les nuits d'été; l'eau du compteur et le gaz qui y passe prement donc cette température, cela ne présente aucmi doute sirtout dans les cas particuliers du laboratoire du Gouvernement, où le gaz passe non seulement dans le compteur d'expérience, mais encore dans un compteur ordinaire d'abonné, situé dans le laboratoire même, comme nous l'avons fait remarquer plus haut.

On peut admettre que la température du gaz dans les conduites, (qui sont posées à un mêtre de profondeur dans le sol) est de 15°; c'est avec du gaz à cette température de 15° que les essais devraient être effectués.

Le gaz passant de la température de 15° à celle de 20°, 25° ou 30°, se dilate plus on moins et l'accroissement de volume lui fuit perdre nécessairement de son pouvoir éclairant.

Le coefficient de dilatation des gaz est de  $\frac{1}{273}$  de leur volume pour 1 degré, ou 0,003665.

Si nous appliquous la formule,

$$V_0 = V X \frac{1 + \cot_u}{1 + \cot_u}$$

V étant le volume du guz consommé pendant l'essui à la température t (température de la chambre).

V<sub>o</sub> étant le volume du gaz à la température 1<sub>0</sub> (température du gaz dans les conduites)

≈ étant le coefficient de dilatation pour 1°, nons aurons pour le cas d'une température de 30°

$$V_{o} = V_{c} X \frac{1 + 0.003665 \text{ X } 15^{o}}{1 + 0.003665 \text{ X } 36^{o}}$$

$$V_o = V X \frac{1.054975}{1.109950} = V X 0.95$$

c'est donc par ce coefficient de 0,95 qu'il faudrait multiplier le chiffre de consommation de gaz donné par les essais, pour avoir le titre absolu du gaz; en ne tenant pas compte de cette correction, on fait une errenr au détriment de la Compagnie du gaz, de 5 % dans le cas particulier que nous avons pris et qui est, nous le reconnaissons, un maximum « en supposant que la température de la chambre ne dépasse jamais 30° ».

Les coefficients de correction aux diverses températures de 15° à 30°, sersient de :

pour	150										1,000
	16°						• • •	• • •			0.996
	170		• • •				• • •	• • •			0,993
	$18^{\circ}$	• • •		• • •							0,989
	19"		• • •		• • •						0,986
	200	• • •				• • •					0.982
	210	• • •		• • •					• • •		0.979
	0)0)0			• • •		• • •					0,976
	230		• • •								0,972
	2.10										0.969
	250					• • •	• • •				0,966
	270					• • •		• • •			0,960
	280	• • •						• • •			0,956
	20°									• • •	0,953
	300	• • •	• • •	• • •	• • •		• • •	• • •		• • •	0,950

La correction relative à la température ne se fait pas à Paris parce qu'on a admis que la température moyenne des chambres noires était à Paris, de 15°.

En été, en effet, la température des chambres moires ne dépasse pas 18°, et en hiver, il est facile de maintenir la température des chambres noires entre 12° et 16°, au moyen de la chaleur artificielle.

La correction est appliquée à Lyon, à St-Quentin et dans d'autres villes de France, mais notamment à Londres.

Il est de toute justice de l'appliquer au Caire, où la température extérieure est toujours au-dessus de la température moyenne du gaz dans les conduites.

(9) Emplacement du bureau d'essais du Gouvernement. — Le bureau d'essais du Gouvernement est situé à 3700 mètres de l'Usine, à l'une des extrêmités de la ville du Caire, et dans un quartier où la consomnation publique et privée est très faible.

Cette situation est des plus défavorables à la Compagnie du gaz, pour deux raisons principales:

- 1°. Il est admis par les techniciens, et par toutes les personnes qui s'occupent de gaz. Compagnies et Municipalités, que par un frottement continuel dans le parcours des combuites, le gaz, si bien fabriqué qu'il soit, perd une partie de son pouvoir éclairant évalué à 1°/<sub>o</sub> par kilomètre.
- 2'. Il est également recomm par tont le monde, que le gaz qui s'immobilise, qui est stagnant dans les conduites, perd également de son pouvoir éclairant.

A l'appui de ces considérations, et pour en justifier le bien-fondé, nous rappellerons que, par application de l'article II, du traité du 7 février 1870, entre la ville de Paris et la Compagnie parisienne du gaz, les bureaux d'essais, à Paris, sont choisis par la ville, d'accord avec la Compagnie, vers les régions moyennes du réseau alimenté par chaque usine.

(10) En outre, et quoique les bureaux d'essais soient situés dans ces conditions, c'est-à-dire dans des emplacements où la consommation du gaz est considérable et où, par consèquent, le gaz ne séjourne pas dans les conduites, la ville autorise encore la Compagnie à purger la conduite secondaire et le branchement ulimentant la chambre noire au moyen d'un bec intensif de 1.400 litres de débit à l'heure, raccordé sur le branchement de la chambre noire et que la Compagnie fait allumer à l'heure que bou lui semble et, au besoin, toute la journée.

En résumé, nous sommes d'avis qu'il sernit de toute équité, que le Ministère des Travaux publics voulût bien tenir compte de toutes les considérations exposées dans la présente note, et reconnaître que la Compagnie du guz du Caire, n'a qu'un but et qu'un désir, exécuter fidèlement les clauses du contrat, comme elle croit l'avoir fait jusqu'ici et remplir tous ses devoirs envers le Gouvernement et envers ses abounés.

La Compaguie est douc en droit de demander de la modération et de la bienveillance à l'Administration Gouvernementale. (11) Nous espérons que l'Administration vondra bien supprimer les amendes, on plutôt les retenues, relatives an pouvoir éclairant du gaz, appliquées à la Compaguie pendant la période de l'été dernier qui court du mois de mai au mois d'août.

Avant de clore ce rapport, je tiens à dire que j'ai trouvé auprès des divers agents du Ministère des Travaux publics le plus aimable accueil et que, en particulier, M. Lucas, chef du Laboratoire, m'a reçu avec la plus grande courtoisie. Il u'a pas hésité à me faciliter toutes choses et à me laisser opérer en toute liberté. J'ai pu ninsi me convaincre qu'il apporte à ses travaux, en ce qui nous concerne, tout le soin et la minutie scientifique d'un bounne de Laboratoire uniquement préoccupé de rechercher la vérité.

Le Caire, le 16 décembre 1903.

Signé: Couderchon.

Ingénieur des ponts et chaussées, Inspecteur de l'éclairage au gaz de la Ville de Paris.

### MR. LUCAS' NOTES

ON

### MR. COUDERCHON'S REPORT.

N.B.—For purposes of reference the paragraphs in the original have been numbered and are referred to below under their respective numbers.

(1) The Government Photometer corresponds, and has always corresponded, exactly in this particular also to the instruments used in Paris.

The Gas Company's Photometer, as mentioned in my report for August last, had an aperture in the eye-piece that was much too small. This has been altered in accordance with Mr. Conderchon's instructions and is now correct.

(2) The instrument is as received from the makers.

The base of the lamp certainly fits too loosely into the scale pan of the balance, but the difference is 4 millimetres and not 6 millimetres as stated.

Care has always been taken in placing the lamp to avoid any inclination from the vertical position.

It is assumed by Mr. Conderchon that the error (if any) has always been against the Company. Since 60 different experiments are usually made each month this is barely possible unless done deliberately. It is likely that the lamp has occasionally deviated slightly from the perpendicular, but probably as often in favour of the Company as against, and in such cases it is usually found that the errors balance one another.

It is proposed to at once fix a metal ring to the base of the lamp so that the diameter shall correspond exactly with that of the balance and any possibility of error will thus be avoided for the future.

The Company's Photometer has the same defect.

(3) The Bengel burner deviates, as stated, from the standard laid down by Dumas and Regnault. It is, however, as received from the makers.

The defective burner has now been replaced by one kindly supplied by M. Conderchon, and examined by him in Paris and found to be correct.

- (4) The Company and not Government fixed the meter in order that they might charge for the gas consumed, and the Government have paid about L.E.4 for the gas used since the testing commenced.
- (5) The entire apparatus has been tested for leakage regularly once each week since it was creeted.

The Company has on several occasions complained of the high pressure in the momentee affixed to the Bengel burner; had there been a leakage this pressure would have been below instead of above the normal.

- (6) The Paris contract does not hold in Cairo, where no hours are specified. Further it has been found necessary in Paris to test the gas outside the contract hours, and since 1887, on the demand of the Municipal Conneil, such extra tests have been regularly made.
- (7) During May, June, July and August various sums, amounting in all to L.E.435.638 mill., were deducted from the Company's invoices on account of the gas being below the contract requirement. Since August no such deductions have been made as the gas has been equal to the standard required.

During May and June there were no experiments "annulés".

During July one experiment was annulled, while during August there were five.

If the tests made on these evenings when one of the three experiments was annulled be entirely disallowed, instead of the results being in favour of the Company, as apparently is thought, it will be slightly against them.

Thus in July the gas was 10.3% below the contract, while in Angust it was 4.2% below. Disallowing all the tests on those nights when one experiment was annulled the mean for the month will be:—

July 10:7°/, below contract, August 5:0°/, below contract,

and the Government could claim a still further (though very slight) deduction from the gas accounts for those months.

For the future an extra experiment will be made and the mean of three instead of two taken, should one be annualled.

(8) I am of opinion that the difference of temperature was taken into account once for all when the contract was drawn up.

In Cairo the burners must correspond with those in Paris, and the consumption of gas per burner must also correspond, but the amount of gas required to equal one Carcel is fixed at 110 littres instead of 105 litres as in Paris.

The mean Paris temperature at 9, p.m. (see attached note) is 10.57°C., while that of Cairo is 20.33°C. Now 105 litres at 10.57°C, will become 108.6 litres at 20.33°C., and under the contract the 105 litres of Paris gas are allowed to become 110 litres in Cairo.

In those French towns where a correction is made for temperature the standard is 105 litres as in Paris and not 110 as in Cairo.

No appeal to the English practice should be allowed, since the whole manner of testing in England is entirely different from that in France.

No reference to a temperature correction is made in the Cairo contract.

- (9) The Company would seem to contend that the gas need fulfil the contract requirements only within a limited distance of the works and that elsewhere it might be of an inferior quality. This is nutenable, (see pages 271 and 277).
- (10) There seems no objection to the Company putting up such a burner as suggested, provided the consumption of gas be not charged to the Government.
- (11) A return of theumount deducted from the Company's invoices for inferior quality of gas would seem to be a tacit admission that the Government tests were not reliable.

In addition I would point out that the meter through which the gas passes to the Photometer registers from 0.15 to 0.25 of a litre too little, or a mean of 0.20 litre.

In Puris any deviation of this kind from the 25 litres is allowed for in tests.

I have purposely refrained from making an allowance for this difference up to the present, although I propose doing so in the future, and thus there has always been an error of almost 1% (0.20 for 10 grams of oil = 0.84 for 42 grams of oil) in favour of the Company.

In conclusion I wish to express my entire confidence in the ability and impartiality of Mr. Conderchon, and in the careful and thorough manner in which all his work was conducted.

To prove that the difference in temperature between Cairo and Paris was taken into account in drawing up the contract.

MEAN TEMPERATURE AT 9 P.M.

	Month.			l'ants (1) (18107)	CAIRO (*) (12 years 1884-1898).
1				3.10	12.10
January February		• • •	• • •	4.16	13.67
March	***	6.01		8.97	1(;•():)
April			101	1(1*1)()	19.78
May		• • •		1.1 *07	27.32
June	0 6 0 0 0 1	• • •		18:00	26 • 2.5
July		100	• • •	19:68	28.06
August			• • •	16.41	26 - 00
September.			***	14.73	21.61
October		***	•••	9.03	22.3()
November.	***	***	4	3.28	17:25
De wiila r	100		• • •	4.01	13.84
	MEAS		•••	10.57	20:33

105 litres (Paris standard) at 10 · 55°C = 101 · 1 litres at 0 ° C, = 108 · 6 ... at 20 · 33 ° C.

105 litres at Paris=108.6 litres at Cairo.

Paris standard 105 litres.

Cairo standard 110 litres.

Annales da Burein central Méteorologique de France, Annee 1896, Tome 11, Observations.
 Report on the Meteorological Observations made at the Abbassia Observatory. Calco, 1990, p. 20.

### EXTRACT FROM

## "PUBLIC LIGHTING BY GAS AND ELECTRICITY",

BY

## W. J. DIBDIN, F.I.C., F.C.S.,

Chemist and Superintending Gas Examiner to the Metropolitan Board of Works and the London County Council (1882-1817).

In the Gasworks Clauses Act it is stated that the Company shall provide a properly-fitted station for testing the illuminating power and parity of gas, but no specific position is assigned for the station, which is usually that arranged by the Company for its own purposes. In the Metropolis Gas Act of 1860, relating to the testing of the London gas, it was first provided that the site of the testing place should be within 1000 yards of the gasworks, but subsequently in 1876 this was altered so as to leave the Gas referees a free hand in fixing the position of the stations, in order that the gas might be tested in the district in which it was used rather than in the near proximity to the making places.

The necessity for more effective methods of testing the illuminating power of the gas supplied to the consumers has been frequently pointed out by the writer in the course of various official reports, in consequence of the discovery that the gas supplied in the district away from the official gas-testing station was very frequently 10% and even 20% below the standard. This fact was also pointed out at Liverpool by Mr. Bellamy, who adopted the system of testing the quality of the gas by the portable photometer, with the result that the supply, although in the hands of a company, was immediately equalised throughout the district, so that all consumers are now supplied with gas of equal value.

(Chapter I, page 86).



## TRAMWAYS AND ELECTRIC LIGHTING

## TRAMWAYS

## CAIRO TRAMWAYS.

The working of the tramways has been very satisfactory, and no abnormal irregularity has occurred. The attached statistics show a considerable increase in traffic and receipts. Thus the number of passengers exceeds last year's figure by 13 "/" and the number of car-kilometres has increased by 20 "/". This is partly due to the opening of the Shubra line in May, 1903. This line connects the Bab-el-Hadid Square with the Nile bank at Rod-el-Farag, following the Shubra road for a length of nearly 5 kilometres. The track is chiefly double.

A great improvement has been introduced from a purely tramway point of view, by laying a line round the Mixed Tribunals. All cars going to Fagadla run now on this line, leaving the old track between Ataba-el-Khadra and the Crédit Lyonnais for the Boulac cars exclusively.

351 metres of double track has been substituted in the Place Mariette, near the new Egyptian Museum, for a similar length of single track.

## STATISTICS.

	YEAR E	NUNG
	June 30th, 1902.	June Suh, 1963.
Length of concession	1 11	
Total number of passengers	46,373	$19,225,331 \\ 52,672 \\ 8 \cdot 2 \\ 4,378,580$
Length of single track lines (metres) Length of double track lines Total length of lines Number of trailer are	22,475 37,771	15,681 27,294 42,975 128 79
H1.—Financial.  Share Capital	2,250,671 1,042,627 46°5 11°7 72,670 40,940 700,000	0,000 2,530,242 1,200,749 47 · 5 13 · 7 85,232 47,351 840,000 0 · 58

## ALEXANDRIA TRAMWAYS AND RAMLEH RAILWAY.

The Alexandria and Ramleh Railway Company have transformed their lines between Alexandria and San-Stefano to electrical traction. For this purpose the trainway generating station at Karmonz was increased by 2 new sets of 1000 HP, each, producing a threeplase current of 6500 Volts. This energy is transmitted to a sub-station situated at Bulkeley, first, by means of an underground high tension cable, running through the town of Alexandria, and secondly, by an overhead line, following the railway-track from the town-end to Bulkley. The sub-station contains 3 sets of step-down and rotary transformers of 300 K.W. each, by means of which the threeplase high-tension current is converted into continuous current of 550 Volts, and distri-Transformers and Switchboard were buted to the contact-lines. furnished and erected by Messrs, Brown, Boveri & Co. and are of the latest type. The high tension overhead line was constructed by the Alexandria and Ramleh Railway Company itself, under the superintendence of this Service and every possible protective apparatus was installed with a view of preventing danger to life, in case of a wire breaking.

The electric traction was started at the beginning of January. The inspection and handing over of the installation took place on December 17th.

The accompanying tables show the extent of traffic on the two lines at the end of the year 1903:—

		A Alexandria Transway.	H Rainleli Rallway,
Length of single track Length of double track	111.	1,125 11,000	7,033 17,161
Total track		12,125	24,197
Villabor of trailors	*** ***	55 45	22 31
Number of passengers conveyed	•••	9,293,272	3,062,749

## CAIRO ELECTRICAL SUPPLY.

The number of private consumers, as well as the amount of current sold, has again considerably increased. This is shown on the attached tables.

6.4 kilometres length of new cable was laid under the public roadways as against 7.9 kilometres in the previous year.

For the purpose of purchasing a new generating plant of 400 HP, the Company requested permission to increase their share capital by 500,000 francs. This request, after examination by the Committee previously appointed, was granted.

Several applications for supplying current outside the limits of the concession having been made by the Company, Government, in individual cases, granted temporary authorization. The distribution of current in the suburbs of Cairo is now being studied by this Office.

ELECTRIC LIGHT, CAIRO.

	YEAR ENDING	30TH JUNE
General.	1902	1903.
Units sold K.W. hours. Increase on previous year % Number of lamps connected (10 c. p.) Units sold per 10 c.p. lamp Arc-lamps connected H.P. Motors connected H.P. New cable laid during year metres. Number of consumers	458,253 24.8 54,152 8.38 79 22 7871 1180	529,478 15.3 64,160 8.25 97 95 6429 1409
Capital Fes. Revenue (Units sold) Working Expenses Cost per unit sold Price per unit	2,500,000 458,144 272,272 0:594 1:00	3,000,000 529,349 342,780 0+646 1+00

Note.—These figures are presented by the Company.

#### Mansoura.

Street lighting has not been extended this year, but the number of private consumers shows an increase of 46°/<sub>a</sub> and has reached the figure of 140, representing a total of 5934 8 c.p. lamps connected.

The figures for 1902 were 96 subscribers and 4350 lamps.

### Heloum.

The pravisional handing over of this installation took place on November 25th, 1902. A temporary authorisation was granted to Messrs. Thos. Cook & Son, to work the plant, subject to the condition that certain modifications were to be introduced and certain defects to be remedied. A second was made on December 1st, 1903, after the Local Commission had stated, in writing, that the installation was complete.

This examination, however, proved that the concessionnaires had not succeeded in entirely overcoming all defects. As stated in our report of December 2nd, the voltage fluctuations were too considerable and caused ampleasant flickering. No provision had been made to prevent the smell of the petrol escaping. The bad smell and load noise, caused by the explosions, led to general complaint, and a petition signed by 150 residents and tourists was presented to the Public Works Department.

The Supply Company were invited to at once remedy these defects and were further required to check the fluctuations by the end of the season. The fund reception could in this manner be pronounced 6 months later. At the end of the first full working year, on December 31st, the extension of the installation is shown by the following figures:

Street lighting: 200 standards of 2 large	1 4 1 2 1	ch,	
private lamps connected (10 c.p.) =		***	1891
Number of consumers=			16
Units sold at in hotels =		***	15000
b) to private consumers =		* * *	17400
Total			32400 KWH

Price per unit 4 P.T.

Street lighting is paid for at the rate of L.E. 2.25 for each lamp of 26 candle power. As this sum has proved to scarcely cover the cost of production, Messrs. Thos. Cook & Son asked for permission to replace the 16-c.p. lamp by one of 10-c.p. and to increase the time of lighting in the same ratio. This would relieve their engines to a certain extent in the early part of the night, and allow for more private lamps to be connected. The High Commission was asked to approve of this alteration, as being generally advantageous, subject to the neceptance by the concessionnaires of a new lighting schedule, prepared by the Government Electrical Service and adjusted to the period of the rise and set of the moon.

Since February, these schedules have been in use, and it has been found possible to arrange the lighting in such manner, that the town

is never in complete darkness. This frequently occurred with the old contract time-table.

The total amount of energy spent in street lighting is the same as before.

## Port Said.

The Government signed a contract for private lighting with Engene Lebon & Co. in July, and the plans were submitted and examined by this service in November. This distribution of  $2 \times 220$  Volts continuous current will be effected by overhead lines on iron poles and wall-brackets throughout the town. The total capacity will be 120 H.P. The concession bears a provisional character and can after the 5th year be withdrawn at one year's notice. Public electric lighting cannot be introduced, on account of the existing contract with the same Company for gas lighting.

### Ghiza and Ghezira.

Tenders for the distribution of electricity at Ghiza and Ghezira were invited on May 12th, 1903. The Gas Company alone tendered, but the conditions offered were considered too onerons, especially so far as street lighting is concerned.

The absence of other tenders may be ascribed to the fact that the present number of private consumers would be very small as compared with the area to be provided with distributing lines.

## Ismailia.

The deed of concession was signed on February 13th, 1903, and owing to the rapid execution of the work the provisional handing over took place as early as July 30th, and street lighting followed at once. The installations were completed soon after and definitely accepted on November 11th, 1903. At the end of the year, 1785 lamps, representing 63 subscribers, and 175 street-lamps were connected to the Company's lines. The total capacity of the plan is 58 H.P. and 3886 units have been sold.

In this town the street lighting is not paid for by Government, but by the Suez Canal Company; Government is interested in this installation only so far as measures for public safety and regularity of service are concerned.

#### Sup=

A contract was signed for the lighting of this town on June 10th, 1902, and the installation was to be finished twelve months later. The contracting party, having failed to finish in time, obtained two prolongations. January 1st, 1904 was fixed as the final date of completion.

Actual work had not been commenced, when in September 1903 the concessionnaire usked for permission to transfer his authorization to the "Société Electrique d'Ismailia." This demand was granted, subject to the condition, that the installation should be started immediately, and that the fine of L.E. I per day should be paid, as stipulated in the original contract, from 1st of January 1904 till the day of completion.

The work is now proceeding.

## Tanta.

Anthorization was given to M. Nahman in 1901 to erect a large generating station to provide Tanta and Zifta, as well as the neighbouring districts, with electric light and power, but, owing to the want of capital, this project was never executed, and a part of it only, the lighting of Tanta, is being carried out now by the "Société Electrique de la Basse-Egypte" which was formed by M. Nahman for this purpose.

#### Telephones.

The Telephone Company was anthorized to establish a double line between Cairo and Alexandria. Communication was opened to the public in May, 1903 and is being largely patronised. The line follows the railway line throughout its length.

The Ministry of Interior has several times asked for advice concerning the police telephones, and local inspection in the district of Zagazig was undertaken by this Office.

Several complaints from subscribers to the Fayoum telephone installation were submitted to this Ministry by the Mudir. The installations were examined by this Service in November and a report, pointing out grave technical defects and general misiming ement, was submitted.

## CAIRO STREET LIGHTING.

In connection with negociations carried on with the General Manager of the Gas Company and concerning the reduction of price for public lighting in Cairo, a project was elaborated by this Service for lighting by electricity all streets which are not at present lighted by gas. It was proposed that this generating station be worked by Government.

Calculations were based on 6000 incandescent lamps and 300 are lamps. According to this project the total cost would be L.E. 2.600 per lamp and per annum, as against L.E. 6.75, the present rate per

gas lamp.

This project, which would mean an annual saving of L.E. 24,900 on the lighting of the whole city of Cairo at present rates, was submitted to the Ministry of Finance in October.

## NEW REGULATIONS.

The regulations drawn up by this Service have been printed and submitted to the Contentienx and the various Administrations and Companies interested.

## KASR-EL-AINI HOSPITAL.

The Director General of the Sanitary Department having decided to light this hospital by electricity, our Electrical Service was charged with the preparation of a project and the superintendence of the installation.

It was found more economical to erect a generating station, than to buy the current from the Gas Company. Continuous current of 100 volt was considered suitable, and a suction gas-plant was chosen for driving the dynamo. A battery of 290 amp. hours, was also provided, to supply current during the night.

Tenders were invited on June 11th, and the work placed in the hands of Messrs. Siemens & Hulske for the electrical part, and of Messrs. Nahman & Co. for the motor and suction gas-plant.

Over 500 lamps and 2 contact boxes for X ray treatment were installed.

The hospital building, Lady Cromer's Home, the Sisters' house, the Medical School and the Director's house are connected to the generating station.

The electrical part was completed on December 16th, whilst the motor plant is still under construction. The output of the dynamo is 20 KW, and the total cost L.E. 1,600.

## CAIRO SEWER PUMPS.

Two centrifugal pumps of 25 HP, each have been creeted on the old Ismailia Canal for pumping the rain water and street-drainage into this canal. The pumps are driven by two singlephase motors from the Gas Company's mains, the high tension current being transformed at the pumping station by our own transformers.

In case of heavy rainfull, these pumps are capable of discharging 4000 cubic metres of water per hour. They were used for the first time on December 24th when they discharged the whole of the street water during a rainfull of 3½ hours.

Since April 1903, except during Jame and July, these pumps have worked once or twice every week, to discharge the surface water accumulating in the pipes.

The cost of ordinary pumping is high and it is proposed to use a wind motor for all work except pumping our rain water. On the night of 11th-12th September the lake in the Esbekieh Garden, containing 3000 c.m. of water and mud, was emptied into the drains, and considerable trouble was caused at the pumping station by the thousands of small fish entering the pipes and choking the strainer. The fish had to be removed by hand.

TABLE SHOWING THE WORK OF THE PUMPS DURING THE YEAR.

MONTH.	l'imes.	Hours.	Amount of water jumped.	K.W. hrs.	Bimarks.
March April May June July August September October November December		2. 21 52   -1020   -102 17 22   -12 17 22	2380 3780 280 2240 7560 6850 6800 21250	80 34 51 4 32 106 98 94 308	The canal was dry (low water).  Emptying of lake in Exhekich Garden.  I torrential rainfall.

## MINOR INSTALLATIONS.

Installations in public buildings, mentioned in last year's report, were, as before, controlled and supervised by this Service. The following new installations were added:—

Museum.—The fire-alarm bell was removed from the front to the police sub-station behind the main building. The 15 copper wires were carried to the roof, where they follow the coping, supported on insulators carried by wooden brackets and poles.

46 lamps and wall-plugs were fitted in the Secretary's house and electric bells in the house of the Director.

Ministry of Justice and Foreign Affairs.—50 incandescent lamps and ventilators.

Post Office Building.—25 lamps and electric bells in the Director's residence.

Lunatic Asylum, Abbassia.—An electric pumping plant of <sup>3</sup>/<sub>4</sub> HP, was connected to the generating station, for pumping water into a reservoir of 100 cubic metres capacity and 12 metres height.

Khedivial Library.—Specifications have been prepared for 6 are lamps and 40 incandescent lamps. The installation will soon be completed by Messrs. Thos. Cook & Son. for the sum of L.E. 108.500 Mills.



# GHIZEH SERVICE AND EZBEKIEH GARDEN HELWAN WATER

## GHIZEH AND GHEZIREH WATER SERVICE

(MR. CURTIS)

A new 25 c/m main has been laid to supply the new Ghezirch Garden, this has greatly improved the whole service north of the pumps, as, since this main was opened, we have no complaints of want of pressure.

A new pumping station was erected below the English bridge with a new compound 65 H.P. semi-portable engine and a 35 c/m Dumont centrifugal pump for the irrigation of Ghezireh. The total cost of this installation was: L.E.1,290.

The old pumping station on the Nile bank for which the above is a substitute has been demolished and the road widened, thus considerably improving this promenade.

The large compound horizontal engine was removed from this station where the area to be dealt with was not large enough to allow of its developing its full power and was erected in Ghizeh, where it will drive a Diamont 50 c/m centrifugal pump. When completed this pump will supply the whole of the low pressure water required by the Ghizeh Service.

Special work to the amount of over L.E.5,000 has been executed by the Ghizeh Workshops at the request of the Departments interested: I may mention the complete installation of the chemical and physical laboratories, including their complicated gas and water fittings, furniture, desks, etc., for lecture and class rooms, museum, etc., etc., of the Agricultural College. The Chemical Laboratory for the Khedivini Agricultural Society was executed on the same lines. For the Geological Museum, show cases, desks and tables were made.

## SUPPLY OF WATER.

	Private persons Town of Ghizeh ORDINARY E	EXPE	Princ	TRE	Gm	ZEH	LE.	1,669 2,067 137 374	482 721 378 813 EXHEREN 185 726 975 937	L.E. 4	210	Wa310
	70								***	LA Fair I	,2 li'	823
	Ex	TRAC	onee:	NARY	Ex	PEN	PITTE	HFL.				
	New office Boring for water Separate water service Garden	. (0)	new		 ezire		LE.	48 147				
	Purchase of water met Purchase of east iron	ers				• • •	11	281 184 623				
						Tot	tal		1	.E. 1	,287	067
			To	tal e	zper	ditn	F#		]	л.Е. 5	,536	800
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1	tement of work exce 1903, not including the Services.	utea repa	l ia airs	the to	(i) the	izeli Gh	i II'	orksh and	iops ;	ior ti	he y	var uter
1	903, not including a Services.	ulea repa	l ia airs	the to	Gh the	izeli Gh	i II' izeh	orksh and	ops .	ior ti zirrli	he y	var uter
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1	General Tanzim Services,  General Tanzim Survey Department, Esbekich Garden Ghizeh Nursery Sanitary Department Heloum Wuter Service Agricultural Society Agricultural College, L Agricultural College Sa Benha Bridge Cairo Tanzim Local Commission (Ass	hemalogundi	ical l	Labo	the	hool	izeh	and	L.E.	172 385 188 97 349 178 66 179 2,105 52 25 410	110 214 024 358 073 184 898 054 026 995 843 720	vear
1	General Tanzim Survey Department Esbekich Garden Ghizeh Nursery Sanitary Department Heloum Wuter Service Agricultural Society Agricultural College, L Agricultural College Su Benha Bridge Cairo Tanzim Local Commission (Ass Sporting Club (Gheziro	repu	ical )	Labo	the	'inool	izeh	and	L.E.	172 385 188 97 349 178 66 179 2,105 52 25	110 214 024 358 073 184 898 054 026 995 843	vear
1	General Tanzim Survey Department, Esbekich Garden Ghizeh Nursery Sanitary Department Heloum Wuter Service Agricultural Society Agricultural College, I. Agricultural College St Beuhn Bridge Cairo Tanzim Local Commission (Ass Sporting Club (Ghezira New Polytechnic	hem aboundr	ical )	Lalle	the		izeh	and	L.E.	172 385 188 97 349 178 66 179 2,105 52 410 455 172 182	110 214 024 358 073 184 898 054 026 995 843 720 815 001 701	ear
1	General Tanzim Services,  General Tanzim Survey Department, Esbekich Garden Ghizeh Nursery Sanitary Department Heloum Water Service Agricultural Society Agricultural College, L Agricultural College, L Agricultural College Su Beuha Bridge Cairo Tanzim Local Commission (Ass Sporting Club (Ghezira New Polytechnic	hem abogundi	ical liratori	Lalle	the craterial section of the craterial section	(ild	iceh	ing	L.E.	172 385 188 97 349 178 66 179 2,105 52 25 410 155 172 182 23	110 214 024 358 073 184 898 054 026 995 843 720 815 001 701 629	ear uter
1	General Tanzim Survey Department, Esbekich Garden Ghizeh Nursery Sanitary Department Heloum Wuter Service Agricultural Society Agricultural College, I. Agricultural College St Beuhn Bridge Cairo Tanzim Local Commission (Ass Sporting Club (Ghezira New Polytechnic	hem abogundi	ical )	Lalle	the		iceh	ing	L.E.	172 385 188 97 349 178 66 179 2,105 52 410 155 172 182 23 103	110 214 024 358 073 184 898 054 026 995 843 720 815 001 701 629 901	ear uter
1	General Tanzim Services,  General Tanzim Survey Department Esbekich Garden Ghizeh Nursery Sanitary Department Helouan Wuter Service Agricultural Society Agricultural Society Agricultural College, L Agricultural College Si Benha Bridge Cairo Tanzim Local Commission (Ass Sporting Club (Ghezira New Polytechnic Old Polytechnic Anglo-American Hospit	hem aborandi	ieal )	Laberes m	the craterial section of the craterial section	Ghi	iceh	ing	L.E.	172 385 188 97 349 178 66 179 2,105 52 25 410 455 172 23 103	110 214 024 358 073 184 898 054 026 995 843 720 815 001 701 629	vear

## HELWAN WATER SERVICE

This Service has been working well throughout the year, an ample supply of water being given.

Two local bores were sunk at the pumping station to a depth of

50 metres without finding good water.

Projects for filter beds are now completed and will, I trust, be executed in 1904.

## EXPENDITURE AND RECEIPTS FOR 1903.

Water sold to private persons meters)	
Detailed Government  Local Commission  Baths and Hotel  Tanzim and Police  Midan Said  Station Garden  Flushing pipes  Receipts: Total	M <sup>3</sup> 72,493 16,978 11,420 9,283 1,632 5,635
From private persons Government account	L.E. 2,394 687 1,468 012

NOTE-fucluded in the sum of expenditure is L.E.10 paid for boring operations,

## SECTION No. 4.

Total... L.E. 3.862

Total Expenditure... ... L.E. 1,788 533

Total Balance... ... ... 2,074 166

The roads on this Section are all in fair condition. This year 6,905 M² of new road has been made, and must be added to the area of macadam. 45,399 M² of road have been macadamized with the steam roller at a cost of L.E.1,678, which works out to about 35 m/m per square metre.

Ordinary repairs to roads with punners and repairs to trottoirs have cost L.E. 766, making a total expenditure for the year on this

Section of L.E.2,444.

## GHIZER NURSERY AND TREES IN SECTION NO. 4.

In 1903, 4,045 trees were supplied by the Nursery and 39,265 pots of different kinds of flowers. At the Horticultural Show in March and Chrysanthemum Show in November the Service was very successful, obtaining two special gold medals and other prizes.

I have already reported on the condition of the trees in Section No. 4. Trees and branches that have fallen down or land to be removed, owing to their dangerous condition were sold in 1903 for over L.E. 200.

Statement of Reveipts and Expenditure for the Ghizeh Nursery and Trees in Section No. 4 for 1903.

TREES, SHRUBS AND FLOWERS SUPPLIED TO GOVERNMENT GARDENS, CARRO,

Elekieh Garden.	
	.245 .510
Cairo Tanzim.	
	1153 ,785
Governorat Damietta.	
Trees	200
Lunatic Asylum.	
Trees	50
Military School.	
Trees	116 499
Section No. 4.	
PT1	120
This represents a total sum of	L.E. 618 660 71 260
To private persons, flowers 469	8 835
Salvaf and - f- w Salt N	L.E. 698 755
Sale of timber from Section No. 4	466 200
Total	L.E. 1,161 955
Expenses,	
Stalaries	L.E. 655 015
Watering and other carts, etc.	167 907
Total	I.E. 992 397

REPORT ON THE ESBEKIEH GARDEN FOR THE YEAR 1903.

Attached is a statement of receipts and expenditures.

The lake has been filled in and its bed raised 40 c/m above the garden level. Owing to the excellent arrangements made by Mr. Curtis the whole of the material required, 9.275 cubic metres, was obtained gratis from carters desirous of getting rid of old building material. The filling by contract would have cost L.E.500. Trees will be planted on the site and the whole space arranged as a playground for children. The gate receipts are L.E.80 in excess of 1902, while L.E. 100 has been economised on water.

## ESBEKIEH GARDEN, 1903.

RECEIPTS FROM GATES			L.E. 1,261	382
Expenses:				
Salaries gate clerks, g	arden rauger	S		321
English Band			<sub>m</sub> 158	000
				L.E. 500 321
ESBERIER GARDEN.				
Gas	*** *** ***		L.E. 346	758
Water			,, 514	449
Salaries	*** *** ***		783	790
Native Band	*** *** ***	1-0	., 302	000
Carts	***			165
Stores, repairs, etc.		***	. 332	030
Cleaning casepools	*** *** ***		., 25	852
	Total		L.E. 2.381	044
	Budget		2.484	000



# REPORT ON THE SURVEY DEPARTMENT

For 1903

BY

CAPT. H. G. LYONS,

DIRECTOR-GENERAL, SURVEY DEPARTMENT.



## THE SURVEY DEPARTMENT REPORT, 1903

## REVENUE SURVEY.

The Revenue Survey was carried on in 1903 in Qalinbia and Daqahlia provinces; the former was completed by July and the latter by Jammry 1904. By the end of the summer a part of Qena Mudiria was begun and directly after the flood had subsided the whole province was taken up. In October the Finance Ministry notified that all village registers of Upper Egypt must be completed before the end of January each year instead of the end of March. This has made a great difference since under the first arrangement complaints could be investigated and errors corrected after the flood, but now all must be completed before it. To carry out this new programme an increase of about 50 surveyors will be necessary in 1904, and the two following years.

I would also draw attention to a point to which I shortly referred in the report for last year; (1) at present a survey is being carried out on a scale of 1:2500 which reclanically is as accurate as the European surveys of the same character, since the scale of permissible errors is the same as that allowed in the Austrian, French and German cadastral surveys. The correctness of the boundaries of individuals' holding is not so great since there is no law which requires a landowner to mark his limits, or to appear and point ont his boundaries at the time of survey, but whenever they are indicated an accurate survey of them can be guaranteed. On this survey a sum of about L.E. 50,000 is being spent annually.

Copies of the maps when completed and printed are handed over with the land registers to the Ministry of Finance and are deposited at the Mudiria. Sales of land are constantly taking place, but there is no accurate system of keeping the maps, which were accurate, up to date; the surveyors at the Mudiria are not sufficiently trained to carry out the work, and I believe that there is no technical supervision to oblige them to do it correctly. Thus in a few months the map no longer represents the actual state of the properties, and the mutation register, being kept up from the data provided by these autrained employés, is

<sup>(1)</sup> Public Works Administration Report 1902, p. 352.

of no use in any revision of the map. Thus the yearly expenditure must go on indefinitely and before any province is revised, I suppose at least 10 or 12 years must pass. For probably the last five of these the maps will not be of much use.

I believe that for an average annual expenditure of L.E.2,000 per Mudiria these maps could easily be kept up to date and all official measurements for expropriation, etc., made; the periodical revision of maps and registers would be much quicker and cheaper since there would be a mup corrected up to date. A cadastral office in each Mudiria would be necessary and they should be technically supervised in order to keep the work up to the necessary standard of accuracy. If registration of title is introduced some such arrangement will be necessary. It could be introduced now, as each Mudiria is finished without difficulty and without in any way delaying the work of the present survey.

In the Instruction Class 59 surveyors have been trained to fill the places of men who resigned or who were dismissed as not up to the required standard, 36 in number.

A considerable amount of work is done also in examining surveyors and draughtsmen for other administrations; in the 14 months ending February 1904, 33 were examined for the Government Lands Department, and 47 for the Sudan Government.

The technical library of the Department has increased considerably during the year:—

	Books and Pamphlots.	Маря.
In the Library 1st January 1903	2 (5.7);	731
Purchased	187	17
Presented	348	33e3
In the Library 31st December 1903	3,191	784

The sale of maps and publications which has been steadily increasing for some years past, increased very markedly during 1903, and a still further increase is probable in 1904 since small landowners will now be able to get copies of the maps they require from the survey parties working in their neighbourhood.

YEAR.	Printed maps	Publications.	Imeings.	Total
1 500000	L.K. M.	1R. M.	LE. M.	t.E. M.
1901	214 9	48 8	537 G	801 3
1902	202 ()	901 2	528 9	1011 1
1903	874 6	122 3	724 2	1721 1
1411117				

The Map Store has already to be enlarged and a sale room must be built where applicants can consult maps and purchase them.

STATEMENT OF PRINTED MAPS, MTC., IN MAP STORE.

	Mulia.	Publications including meleorological monthly sheets.
In Store 1st January 1903 Received during 1903 Issued during 1903	 216,095 323,068 135,888	91,063 74,740 32,552
In Store 31st December 1903	 403,276	133,251

The issues have largely increased showing that a fuller use is being made of maps, both by Government Departments and by the public.

ISSUES.

						31.1	IPS.	Publications.		
		YEAR	R.			Free (1)	On payment.	Fren (*)	On payment	
1901	• • •					24,550	2.847	9,009	235	
1902	•••	• • •		0 0 4		38,086	4,137	15,847	801	
1903		•••		0 0 1		122,817	13,071	34,904	1.648	

<sup>(1)</sup> To Government Departments.

C) Mostly monthly meteorological observations sent to Government Departments and to other Services and Observatories.

## THEODOLITE THAVERSING.

The improvement recorded in last year's report has been well maintained, though circumstances have tended to mise the cost. Communication in Upper Egypt is not so easy as in the Delta, and the alteration of the programme by the Finance Ministry, which has already been mentioned, has necessitated training 20 new traversers whose work is slow at first. The work done is shown in the following table:-

SUMMARY OF TRAVERSE WORK DONE IN 1903.

Name of Musirus	Arva tratered in feldam.	Area traveposit tri my kilom	Chalmage in Alban.	montest legate traceles vir of	No. of men working day	Prints just 1818	ivents  er  working  day	Trans	leight fait f wit
*								Lit	MII I.,
Issqahlia	116,115	용하다	1,735	5,125	1,062	10.5	4:73	200	115
thirtin	392,100	1,647	5.740	19,8m;	2.647	11-7	7-27	2,036	165
Asunn	28,661	120	915	3,773	531	31 - 1	7-10	711†	189†
Girga	20,025	124	144	1,346	O-pag	15-14	4 · 5	337	170
Total	386,513	2,379	a,sat	30,150	1,160	12.70	(-75-	3,6721	122*

<sup>·</sup> Average.

2 L.E. 3,743 mided which was actually spent in Qallubia.

In comparison with previous years these data are:-

	1561	1945	11413
Cost per square kilom I.E.		1.708	1:540
Cost per point		0.123	0-122
Points per square kilom	16	13.8	12:7
Kilometres chained per square kilom	1-(1()	4.13	:1-7
Average namber of points per surveyor per	ti	5.5	17:75
Average length chained metres per day		1653	1980

<sup>.</sup> The figures given in insl year's report are incorrect and should be as now given.

The accuracy of the work has been consistently good. Considerable trouble was caused at first by the removal of marks, but this was

<sup>†</sup> The cost of Assum does not include travelling and freight charges on the War Department bouts.

reduced by the local authorities, after a short time though a good deal of it still goes on.

## TRIANGULATION.

During the year the unifor triangulation of about one-third of Qena and Girga, and of Aswan from Dakka northwards to Esna was completed, but the comparative want of economy of the method necessarily adopted in the Nile Valley (that of triangulating a strip of quadrilaterals connecting points on the escarpment on each side), was markedly felt. In consequence it was found impossible to complete the major triangulation from Dakka to the frontier. The Revenue Survey accordingly was based on the minor triangulation only in this district. The accuracy however, is more than sufficient for the wants of the Revenue Survey. In pursuance of the general plan \* bases were measured at Addendan, Dakka and Khattara. The measurement of the latter was only completed early in 1904, but since it falls more naturally into place in connection with the work of last year, it is referred to here. A base was also measured at Tema for the Girga triangulation.

Chiefly owing to the fact that the requisite staff of inspectors for using the Jäderin apparatus could not be spared at one time, it was decided to measure these four bases with the 100-metre steel tape already employed for the Faynun base, but experience with it seems to indicate that the risks of error with the wires are less than with the tape. The latter demands extremely calm weather for the best results, a state of things which it seems impossible to look for in Upper Egypt during the winter months when the tape can otherwise be most successfully

employed.

The general arrangement of the measurement has been as follows: The base is subdivided into two or three sections of from 700 to 900 metres each which are measured separately. Each section is laid out in 100-metre lengths marked by stout stakes to which a fiducial mark is attached. Every 20 metres a light staff carrying a roller on the top is placed to support the tape. The tops of the rollers are carefully graded so that the slope from one stake to the next is preserved. In the actual measurement the distance from the ends of the tape-length to the marks on the stakes are measured and the tension and temperature read. The tape is then slightly disturbed and a new set of

<sup>\*</sup> See Public Works Ministry Report 1902, p. 356.

readings taken. These small distances were read in different ways at different bases, but the method found most successful was to nail to the stakes strips of zinc 30 centimetres long on which millimetre scales had been engraved.

During the year an error in the computation of the Gebelén and Ambir bases was discovered, fortunately in time to allow the necessary corrections to be made for ensuring the accuracy of the maps of Qena Mudiria, which alone was affected. The revised results for these bases are now \*:—

Gelælén Ambir							***	***	3t <sub>el</sub> 2304 2323	
The cost of the major	tri	ang	ulati	ion '	Wils	:			L.Y.	м,
l'ersonnel		• • •	***		***				1,303	870
Transport and marks Measurement of bases	• • •		***	***	• • •		•••		615 148	011
	• • •		•••				•••	I.	E.2,066	881

for which 4,100 square kilometres were triangulated.

### STATISTICAL DETAILS.

## Major Triangulation.

	Duquhlin Qaliubia.	Q-m.	Girga.	Aswan.	Aselut.
Extent in square km. Time taken in days Stations occupied Lines observed Triangles Average length of side (metres) Cost L. E. Cost per square km. L. E. Cost per station L. E. Average error of closure of triangles	93 48 15.000 1.290 0.437 31.5	1.277 153 29 86 66 15.000 599 0.469 20.7 2".19	1.441 165 21 48 46 16.006 612 0.425 20.1 3".04	2.662 270 31 73 56 17.000 804 0.302 25.9 2".48	70†

<sup>\*</sup> Cf. Public Works, Ministry Report 1902, p. 326.

<sup>+</sup> Reconnelsance only.

## MINOR TRIANGULATION.

Except in summer four parties were steadily at work. The area covered extended over half of Qena and Girga and the whole of Aswan.

The total cost was:-

									1.460
Personnel	* * *	 	 	 				1 0 0	455
Tenusport		 	 	 	1 = 0				43
Marks.		 	 	 		0 0 0	4 = 4		****
									1.958

for which an extent of 4,200 square kilometres was triangulated.

## MINOR TRIANGULATION.

		Qenn 1903.	Girga 1903.	Assen 1903.
Extent in square km		897	1,141	2,117
Time taken (days)		307	366	499
		191	187	286
Lines observed		351	470	725
Triangles		286	251	288
	0 = 1	3.2	3	5
Average length of sides, metres		3,200	3,000	4,5(X)
Cost L.E		439	751	659
Cost per sq. kilom L.E		0.490	0.659	0.311
Average error closure of triangles			3".2	2".5

The computation work has been similar to that of the previous year, Improvements in the methods of cheeking have, however, been introduced, so that every step of the work is now checked, either by computing backwards direct from the final results to the observed values where that is possible, or by independent computation where the other method is unavailable. The plotting of the map-sheets is further checked by a repetition of the process independently.

#### COMPUTATION OFFICE STATISTUS.

	1901.	1642.	1:47%
Points computed	\$3,000	53,136	31,380°
Length of lines computed Kilom.		12,142	9,500
Sheets plotted	2,300	5,026	4.968
Area computed Fedd.	_	875.011	714,132
Villages computed	_	510	302
Total cost l.E.		2,079	2,343
Cost per feddan	_	238	132

<sup>\*</sup> Exclusive of 2,000 points for the topographical work and town survey work.

The falling off in the area computed is due almost entirely to the effect of the Nile flood in stopping field operations; also the area given is the actual area inside the boundary lines of the villages as derived from the work of the survey and is not estimated as was the case in former years.

The number of points computed is less since in former years points on the village boundaries were computed twice, once in each village; as the work became more organised this extra computing, which was numecessary, was avoided. The time economised in this way enabled the Computation Office to furnish all the taffishes with the areas of the villages inside the boundary lines, to be used in checking the area found from the sum of the individual holdings.

The astronomical computations for the almanues were made as usual. There is evidence that as the Government Almanac is becoming better known its usefulness is increasing. Several additions were made to that for the current year which was published in November.

With the exception of the computers in the triangulation section, there is not a computer in the office who has had any previous mathematical training except in the elementary rules of arithmetic. Owing to the absence of any institution in Cairo where the requisite instruction can be obtained in the hours at the disposal of the employes of the Department, it has been necessary to train the whole of the junior staff, and in some degree, the senior also, in the office.

## FIELD SURVEY.

At the beginning of 1903 both Qaliubia and Daquhlia Mudirias were in hand, and both were completed during the year, the total area completed during the year being 752,000 feddans which is the largest area hitherto completed in any one year. Together with the increased rate of work, there has also been a steady reduction in the cost per feddan during the last two years, both in field and record work.

Yran	t not of field work.	Cost of record work. 100 per feddans.	Total cost per 10 feddans.	
	Tall, M.	1E. M.	1.H. M.	
1901	1 428	1 154	2 582	
1902	1 400	0 700	2 100	
1903	1 120	0 503	1 732	

This reduction of cost, as also the large area completed during the year, is partly due to the large areas of "barari" lands in Markaz Dekernis, and also to the 'Kharig-el-Zimam' lands in Markaz Nawa, Qaliubia.

On January 1st 1903, there were 91,000 feddans under survey in Qaliubia Mudiria, and by May the whole Mudiria was completed.

The total deficit in the Mudiria was not as large as was anticipated owing to the excess along the edge of the desert and in Kharig-el-Zimam hands referred to above, which balanced to a large extent the deficits which there would otherwise have been.

In Daqahlia Mudiria there were 248,000 feddans under survey at the beginning of the year.

The whole of this Mudiria was completed by the end of the year, that is to say the 248,000 feddans above mentioned were completed, and 402,240 feddans were begun and completed during the year.

The first villages in Qena Mudiria were taken up in September 1903 and subsequently the whole Mudiria, except 12 villages was taken up in the field before the end of the year.

Thus the area carried forward at the end of the year as partially completed, namely 337,952 feddans, almost exactly balances the area brought forward partially completed at the beginning of the year, i.e., 339,942 feddans. This bears out the figure given for the out-turn of the year, i.e., 752,000 feddans.

## STAFF EMPLOYED ON REVENUE SURVEY.

STATP.				Revenue Survey.	Traverse Section.
Chief Engineers Engineers Assistant Engineers Messahin Computing and Checking	• • • •	0 0 0	 • • • •	9 32 17 250 28	1 9 21

## ARRAS SURVEYED IN 1903.

		1902-3		1903		1908-4	Total	
Markaz.	No. of Villager.	Feildans.	Na. of Villagor.	Feddans.	No. of	Feddans	Feddaus.	Hemarks.
Dawahi Masr	12	14,603	1	1,403			16,006	
Qaliub	30	47,073	5	9,495		_	56,568	
Nawa	17	45,880	_	-	_	_	45,880	
Tukh	35	57,305	_	-	_		57,305	
Fareskur	21	36,675	3	13,399	_		50,074	
Mit Ghamr	5	7,040	57	64,254		_	71,294	Areas given in column 1903-4 are approximate only.
Mit Samannud	-	_	67	71,726		_	71,726	Airmi
El Simbellawen	99	36,260	35	63,407	_	_	99,667	i i i i i i
Mansura	51	69,888	2	2,497	_		72,385	i i
Dekernes	15	21,990	57	183,226		_	205,216	903-1
Shibin el Kom	1	3,228	-	-	_		3,228	1
Kafr Sagr	-	_	1	3,732		_	3,732	i coin
Deshna	-	-	-	-	15	60,517	60,517	Neu II
Esna		_	-	_	17	47,037	47,037	54
Luxor		-			16	68,922	68,922	An
Nag Hamady		-	-	-	19	49,814	49,814	
Qena		_	-	-	20	51,029	51,029	
Qus			_		27	60,633	60,633	
Total	-	339,942	-	413,139	-	337,952	1,091,033	

— 307 —

Time and Cost of Revenue Survey per 100 Feddans.

MARKAZ		of Person	duns.	per 100 fe		Cost per 10	st per 100 feddans.		
MARKAZ		Villages,	Arm in Peritum	Field Work.	Records.	Field Work.	Records.		
						L.E. M.	L.E. M.		
Nawa	0 0 0	17	45,880	2.6	1:5	0 637	0 287		
Dawahi Masr		13	16,006	5:3	2.5	1 232	0 402		
Qaliub		35	56,568	54)	2.8	1 051	0 502		
Tûkh		35	57,305	7:3	5:2	1 594	0 670		
Mansura	400	53	72,385	-1.1	2.4	0 944	0 425		
Dekernes	, , , , ,	72	205,216	3.6	1.0	0 737	0 239		
Fareskur		24	50,074	4.7	2.6	1 065	0 342		
Mit Ghamr		62	71,294	614	5.2	1 278	0 799		
Mit Samannud	• •••	67	71,726	3.4	2-9	0 849	0 499		
El Sinbellawen		57	99,667	5.2	1:4	1 156	0 275		
Shibin el Kom		. 1	3,228	8:4	14.1	1 875	1 895		
Kafr Saqr		. 1	3,732	4:3	3.4	1 447	0 299		
					-				
		Av	ernge	5.05	3:80	1 155	0 553		
A	astiti	e in !	1902	5:92	5.04	1 400	0 700		

AVERAGE SIZE OF PLOT.

MARKAZ	Number of	Youal No. of Plots.	Flots under	Perferentiation,	Plota mider 5 feddam and ever 12 qirate.	Perentage.	Phila over	Percentago.
T.	31	40,080	15,655	39-1	21.072	52%	3,353	8:3
Etsa	25	39,469	18,474	46.8	18,781	47.6	2,214	5.6
Faynu		45,576	20,412	41.8	22,443	40.0	2,721	ij*(1
Samures	50	40401111	207,412	1212 01	, 7 2 . /	1.	=,	
Shibin el Kom	60	58,904	22,431	384	35.128	59%	1.345	1.3
Menuf	58	62,107	21,158	341	39,478	(1.)	1,471	2.4
Questin	61	38,005	10,499	27.6	21.718	155*(1	2.788	711
Ashmuu	32	31,362	11.233	35'8	19,049	60.7	1.080	3.2
Tula	35	53,767	18,965	35.2	32,515	50.5	2,287	4.3
£ 13 34 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		,						
Nawa	41	25,976	9,589	36.5	14,545	560	1,812	7.1
Dawahi Masr	14	4,830	1,667	31.5	2,522	32.7	641	13:3
Qalinb	35	17,560	4,653	26.5	11,235	15.1.(1)	1,672	9.5
Tukh	59	40,417	16,152	-10-7	21,849	541	2,116	5.5
								-
Dekernes	72	51,092	20,634	40.4	26,692	5212	3,766	7:4
Fure-kur	36	11,109	3,483	31.3	5,551	50.0	2,075	18.7
Mansura	63	25,090	7,625	30-4	15,315	61.0	2,150	847
Mit Ghamr	81	35,813	10,672	29.8	21,769	60.8	3,378	9:4
Mit Samannud	57	25,073	6.542	26.1	16,248	64.8	2.283	9.1
El Simbellawen	83	35,828	9,397	2612	21,725	60.7	4,706	13.1
			(1.15.)		20.553	17134.9	2 41.0=	6:9
Embaba	35	32,891	9,852	300		63.1	2.267	16.3
Gizn	25	12,765	3,516	27.8		55.9	2,078	5.4
Ayat	17	15,385	7,356			46.8	830	
Saff	26	20,868	6,803	36:2	12,925	61.5	1.140	505
			1			1		

Besides this large scale survey primarily for revenue purposes an attempt has been made during the past few years to produce topographical maps of Egypt on scales of \(\frac{1}{10000}\), \(\frac{1}{10000}\), and also a general map on the scale of \(\frac{1}{250000}\). The sum allotted has hitherto been but little, though Government Departments are constantly asking for these maps. Certain portions have been surveyed with funds provided by the Irrigation Service, but this is most uneconomical, as survey parties are being moved from point to point to take up different areas at short intervals of time, and thus both time and money are wasted.

The area is revised in the field for publication on the scale of \( \frac{1}{10008} \) and from these the \( \frac{1}{20008} \) sheets will be reduced. The following table shows a creditable result for the small staff of 18 young Egyptian surveyors, all of whom have been trained in the Department, under Mess:s. Dowson and Weldon, the inspectors in charge. At the present rate it will be a long time before Upper Egypt gets any topographical maps and unless more funds are allotted to this work.

Topographical revision in 1903.

PROVINCE.	Nu. of unipe done in the year	Area of map in eq. km.	Total area revised in eq. km.	Meu working days,	Work- ing days per map.	Sq. km.  **  working  day.	Total cost in L.F.	Cost per sq. kilm.
Hehera	49 150° 8	25 21 19.2	1,225 3,600 153,6	955 2,439 124	19.5 16.9 15.5	1.02	692 1,280 133	0,565 0,349 0,876
Total	ক্লা		4.970	3,618		1,37	2,007	0,412

<sup>.</sup> Calculated as 150 full sheets but more actual sheets were supplied.

Towns finished in survey defore end of 1903.

NAME OF TOWN	No, ol tra- verse marks	A. Chort Trevit.	B, Open Town.	Country,	Town area (A+B)	Fravers- marks per Sq. kill of town aren.	Total cost	Cont por equipme kilons	No. of them-working days.	Work- lug days per squaru kilom
Suest	_	_	-	_			131	_	247	_
Helwan	N.		-	_	-	_	13	-	78	_
Mit Ghamr	200	2,111,210	108,140	181,000	322,380)	637	132	410	217	767
Mangara	915	832,903	739,403	ability by	1,572,916	352	39=	503	1,111	723
Total	1,205						707		1,716	

N.B .- Sucz and Helwan were only partial surveya.

Drawing Office. — In the Drawing and Lithographic Offices work has been carried on similarly to last year. The cost of authographing and printing a revenue survey map sheet about 44 cm. × 48 cm. is

Tracing, writing, correcting Transferring, proving, printing Materials including zine sheet	 					50	9.0
		Tou	al	0 0 0	•••	465	Mill.

Paper is not included, as the number printed varies considerably according as parts of one or more villages occur on the same sheet.

The cost is slightly less than last year.

The topographical maps are fair drawn from the revised field sheets and then lithographed and printed in 3 or 4 colours.

The cost of the production of these sheets is as follows:-

Topographical 1000

	Rehera.	Gharbia.
Drawing Office.	ers / zee	005 / ccs
Drawing	2571	3336
Lithographic Office.		
Lithographing	1210	1565
Printing Office.		
Proving	2599	3517
	6380	8418
Single sheet	42.5	42

This cost is rather above that reported last year, but is a more correct estimate, as it includes several small items which could not be accurately included in last year's estimates.

The preparation of \( \frac{1}{30000} \) sheets is in hand, but want of funds prevents their publication at an early date. They are reduced by

photography from the  $\frac{1}{10000}$  sheets to  $\frac{1}{30000}$ ; blue prints on this scale are then prepared and these are drawn up for final reduction to  $\frac{1}{30000}$ .

The staff of the Drawing Office was :-

			European.	Egyptian.	Total.
9 9 1					-
Superintendents			7	2	5 9 18
Authographers				18	18
Draughtsmen, 1st class 2nd			2	6 9	8
Arabic writers and typers.			_	7	7
Printers			4	11	11
Assistant photographers .			1	_	1
)	• • • • • • • • • • • • • • • • • • • •		1	27	2 8 2
llerks		• • •	_	2	2
Total.			21	68	89

## STATEMENT OF MAPS AND PLANS PRINTED.

	1902.	1903.	Total copies in 1903.
		Number.	
Revenue survey map sheets  Topographical maps 10 h o other scales  Departmental maps and plans  Extra-departmental maps and plans.  Tracings Departmental  on repayment  Circulars and forms  Line and half tone blocks	4.348 121 30 31 185 661	4,328 1,331 168 23 96 17 — — —	259,680 33,275 29,600 4,650 33,190 13,500 247 927 150,000 6,560

The geological staff were employed on measuring the discharges of the Upper Nile at Khartonm and Dueim, and each inspector was occupied in this work for about five months. In the remainder of the year Mr. Barron revised the geology of the country between Cairo and Suez, while Mr. Beaduell continued collecting the fossil remains from the Upper Eccene beds near the Fuyum. Dr. W. F. Hume was fully occupied with the arrangement of the Museum collection.

During the year reports on a part of the Eastern Desert and on Baharia Oasis have been published.

An arrangement has been concluded by which the Trustees of the British Museum will include in the monograph they are about to publish, full descriptions of the Eocene Vertebrata which have been collected during the last two or three years from the desert north-west of the Fayum. By this means the whole of the material both in Cairo and in London will be described in the same monograph. Dr. C. W. Andrews has been detailed by the Director of the British Museum Natural History Department for this work.

Meteorology.—New stations were equipped during the year at Mongalla and Ghaba Shambe on the Bahr-el-Gebel, at Wau on the Bahr-el-Ghazal, at Doleib Hilla and Nasser on the Sobat and at Abbassia Hospital to preserve the continuity of the observations there when the Observatory is moved to Helwan. Rainfall stations were established at nine places in Behera Province.

It may be useful to mention here the present position of the meteorological services in Egypt and the Sudan at the end of 1903.

1st Order Station.—Fully equipped with self-recording instruments for registering continuously all meteorological phenomena. Abbassia Observatory, Cairo.

2nd Order Stations.—Recording atmospheric pressure, temperature, humidity, rainfall, wind by means of observations taken twice or thrice daily.

EGYPT.

Alexandria Abbassia Military Hospital

Port-Said Giza Assint Aswan

SUDAN.

Wadi-Ihdfa Snakin
Berber Khartoum
Wad Medani Ducim

Mongalla

Climatological Stations.—Recording temperatures, lumidity, rainfall, wind.

EGYPT.

Beni-Suef

SEDAN.

El-Obeid Kassala

Wau Doleib Hilla (American Mission Station)

#### ABYSSINIA.

#### Addis Abeba

Rainfall Stations.—Recording rainfall and wind.

#### EGYPT.

Mersa Matruh Mex

Teh-el-Barud Dannanhur Abu Hommos Kafr Dawar

Hosh Issa Atfih Shubrakhit Kafr Bulin

Khatatba

#### SUDAN.

Gallabat Erkowit

Gedaref Khashin-el-Girba (Atbara)

Kodok Nasser.

Gliaba Shambe

The observations of first and second order stations are printed monthly, and the others annually.

#### ABBASSIA OBSERVATORY.

In view of the transfer of all the instruments at the end of the year to the new site at Helwan no new work was undertaken during 1903. The self-recording instruments worked satisfactorily throughout the year. The noon Time signal was sent regularly each day by the Standard Mean time Clock, and the Time Ball at Port-Said was dropped by it. At Alexandria the mast of the Time Ball on Kom-el-Nudura broke early in August and by the end of the year it had not been repaired. The Time Ball signal at this port was not, therefore, given automatically during this period.

#### LABORATORY.

The work of the Laboratory may be devided into four main branches:-

(1) The chemical analysis of various articles for purity, value and conformity to specification;

(2) The physical examination of cements and hydraulic limes for tensile strength, soundness and fineness of grinding, and the examination of bricks and building stones for crushing weight, etc;

(3) The testing of scales and weights;

(4) The systematic testing of the public gas supply of Cairo for pressure, purity and illuminating power, and the examination of various burners for consumption of gas and intensity of light.

In addition to the actual chemical and physical examination of samples a certain and a growing, amount of consulting work is also done, technical opinion being frequently asked by various administrations on special points.

In 1903 a total number of 561 samples were examined as compared with 362 samples in 1902 being an increase of 55%. In addition to

this the gas testing was entirely new work.

1. Chemical Section.—During the year 288 analyses were made as against 225 in 1902, an increase for the year of 63 samples or 28"/o. Of these analyses 195 samples (67°/o) were done for the Public Works Ministry for which no charge is made; 42 samples (14°/o) for other Government Departments, a nominal fee being charged in each case; and 51 samples (17°/o) were received from non-government sources for which a regular tariff is in force.

Among the articles submitted for analysis \* were 28 samples of well water from various parts of the Delta, all of which were either in actual use or suggested for use as drinking water. Of these only one sample was of really good quality and this was from the edge of the desert on the outskirts of Cairo. Two other samples, however, were passed as potable, although both of them were inferior to a good average sample of Nile water. Thus 89 % of the well waters examined were quite unfit for drinking. In some cases the water was simply too salty to be used, but in many cases the water was hadly contaminated organically and little better than dilute sewage.

Signal instances of particularly impure waters were (a) samples of water from a sakia and also from a so-called artesian well at Danamhur, and (b) from a well at Zeitun. The one sample of excellent water was also from Zeitun.

2. Physical Section.—A total of 111 samples of cement and hydraulic lime were examined for tensile strength, etc., as compared with 113 samples in 1902, being a decrease of almost 2 %/a; while 162 samples of brick and building stone were tested for crushing strength, etc., against 24 in 1902.

<sup>&</sup>quot; The analysis is a chemical one only and not bacteriological.

The greater part of these 162 samples, however were typically examples of the various Cairo building stones which were examined for the Geological Museum, so that a full description of each stone might be exhibited with the specimens.

- 3. Weights and Scales.—Weights were examined on several occasions for the Railway Administration and a weighbridge belonging to the War Office was thoroughly tested with various loads from 25 to 500 Kil.
- 4. Gas Testing.—At the beginning of the year a complete set of new apparatus exactly similar to that used at the present time in the Paris gas testing stations was received and creeted, and regular and systematic testing was commenced.

From April to December inclusive the gas was examined on 184 different nights.

In April, the first month during which regular testing was done, the mean illuminating power for the month was found to be 19:5%, below that specified in the contract.

As soon, however, as this was brought to the notice of the Company a considerable improvement was at once made, with the result that in May the illuminating power was only 6.9%/n below the contract. In June, July and August the illuminating power was 6.1%/n, 10.3%/n and 4.2%/n respectively below the standard, but in each of the succeeding mouths from September to December inclusive the illuminating power was slightly in excess of that specified.

On three occasions sulphuretted hydrogen, which is prohibited under

the contract, was found to be present.

The recorded pressure has always been above the contract requirements, which, however, are fixed very low, except occasionally when

the gas has been turned off for a short time.

In December the Gas Company brought out us an independent expert, the chief inspector of the gas service in Paris. This expert, with the permission of the Government, examined the apparatus in use in the Government Laboratory and checked the methods of testing employed, and both he and the Company expressed their entire satisfaction with the manner in which the tests were performed, and also excepting on two very minor points, with the apparatus used, which is exactly similar to that employed in Paris and is supplied by the same makers.

Incandescent Lighting.—In addition to the regular testing of the gas for conformity to contract requirements much other work has been done

on the relative values of the light produced by different incandescent burners and mantles, and also on the intensity of light emitted by incandescent mantles in various stages of efficiency, in order, if possible, to arrive at some satisfactory method of classification that would be of practical use during the nightly inspection of the street lamps by the Gas Service.

The following tables show in detail the amount and nature of the work done during the past twelve months:—

Sertion.	No of samples examined.	Fees received.		
		L.E. M.		
Themical Section	288	49.800		
Physical Section	273	36.633		
Total	561	86.433		

From	Samples -	of examined.	Fina received	
FFOII	Chemical Section.		1119 11111111	
Public Works Ministry: -	41 9	150 )		
Survey Department Tauzim Department Irrigation Department		11	No charge.	
Department of Antiquities	9		L.E. N.	
Ministry of War	15		3.000	
Railways Administration	17	_	3.4(10)	
Wakfs Administration	-	3	0.300	
Sudan Government	9	_	5.000	
Army of Occupation	1		2.000	
Non-Government Sources	51	100	72.733	
Total	288	273	86.423	

	No of samples examined.				
Nature of sample.	Chemical Section.	Physical Section.			
Ores, minerals, etc	-47 -34 -3	162 111 —			
Lubricating oils Drinking waters Drainage & irrigation waters Soils, etc	20 28 35 43 12 15	-			
Total	288	273			
Number in 1902	225	137			

#### GAS TESTING

Month.			Nº of nights illuminating power tested.	No of tests made.
June July August September October Noyember			24 18 20 20 20 20 20 20 23 19	72 54 60 60 60 60 60 69 57

The investigation, began in 1902 on the soil and water of the Wadi Tumilat lands under reclamation was continued in 1903, but owing to the pressure of the rontine analytical work, which increased 55% during the year, it was found impossible to do more than examine a few samples of soil and once a month a sample of the drainage water from the Kassassin pumping station.

One of the samples examined was a heavy clay found to be practically untillable; samples of this were taken from the surface and from depths of 20 cms, and 30 cms, respectively below the surface; in no case did the sodium carbonate amount to more than 0.8 per cent, but

even this small amount was sufficient to make the soil sticky and to account for the difficulty experienced in working it.

The following were the results obtained:-

Laboratory No	[Dergatila	Musture	Sodium	Sodium lacarbonate	Sodium chloride
236 237 238	surface. 20 cms. 30 cms.	96 8.75 9.61 9.31	0.05 0.05 0.02	% 0.42 0.21 0.38	96 0.20 0.08 0.03

The use of lime or limestone was recommended, or, if these were found too expensive, sand was suggested. Any one of these three materials would render the soil more open and porous and hence lighter to work and more easily drained.

The percentage of injurious salts in the drainage water from Kassassin was practically the same in 1903 as in 1902. The details are given in the following table:—

PARTS PER 100,000.

		1902						1903		
Молти	Matter in Solution	Sodium Chforide	Sulphare	Sodium Carbonate	Richerham	Solution	Sodiau	Zulphute Zulphute	Kalimu	Sodmu
January	_	_	-	-	-	119-2	53*96	33.73	nll	59:99
February	-	-	-	-	-	149-2	55.56	35-59	ail	57*12
March	116-8	15.71	25.82	nil	_	152*4	66*02	35.07	nii	67:20
April	123-6	45105	32.64	1101	_	127-2	49.37	28-74	nll	65-69
Мау	120.0	W-35	33169	trace	_	117.6	45.92	27*(1)	nil	68-84
June	181-2	59-77	10.79	trace	_	124-0	53.18	32.30	6:36	52.92
July	110.4	14.53	29:10	nIl	_	121 - 2	16-10	28-13	nII	46:36
August	95-2	37:50	25*(E	train	-	96*8	31.80	21.43	nil	87-12
September	%i)*(L	29 - 55	23:01	Irace	-	81.2	31:32	17:96	nil	82-04
October	87:6	33:29	22-28	trace	-	86*2	32-18	21:37	nil	52:08
November	98*0	36.11	26:43	trace	52*08	81-2	29+00	17:29	nit	52:08
December	101*2	37.89	21 - 56	all	61.32	87.8	38:28	16182	nll	60*48
Меап	106*6	12:37	28+23	_	56.70	112-3	41.90	26*50	_	58-31

It has been a year of great pressure of work in the Department and Messrs. Humphreys and Craig, Chief Inspectors, and Mr. Hansard, in charge of the Drawing Office, have had much difficulty in keeping the out-turn up to the increased requirements; the Inspectors in charge of Survey Taftishes have all done very well and have improved both the quality of the work and the amount, though local interests often greatly increase their difficulties.

During the summer of 1902 instructions were received from the Ministry that in future the records of all Nile gauge readings, south of Aswan, should be kept by the Survey Department. Measures have been taken to systematise the taking of gauge reading as far as possible, and there has certainly been an improvement; counterfoil observation books have been provided and the readings are forwarded weekly, and on receipt, are printed and circulated.

The ganges which exist at present are:-

Nile	}	Wadi Halfa masonry gange Records from 1891 Berber temporary 4th May 1900 *
Blue Nile	}	Atbara temporary Roscires Semar " Wad Medani " Khartoum on masonry river wall †
White Nile	1	Dueim temporary iron plate gauge Tanfikia inclined teak gauge
Solut	{	Nasser inclined teak gauge Deleib Hilla
Buhr-el-Jehel	{	Ghala Shumbe vertical iron plate gauge Mongalla inclined teak gauge Gondokoro " " "

Most of these gauges have been moved from time to time, so it is desirable that the changes should be recorded.

Wadi Halfa.—A masonry gange built in 1890 and not changed since its zero is at R.L.

Berber. - A temporary gauge.

Athara.—A temporary wooden gauge unsuitably placed.

Khashm-el-Girba.—A gange cut in rock by Mr. C. E. Dupuis in April 1903.

Khartoum.—A masonry gange on the river quay wall near the works Department. According to the levels of the Sudan Railways the zero of the gange is at 1213 ft. = 369.71 metres (very approximately) above Suakin sea level.

Also during the floods of 1881 and 1882,

<sup>†</sup> Also during the Hoods of 1869-1883.

It was temporarily moved in June 1903, during the building of the river wall, to a point not far off, but the level was carefully preserved and consequently no correction is required to the readings.

At Roseires is a temporary gauge which has been more than once disturbed. It is an iron vertical gauge placed in a sloping bank. It is 2 metres long and is movable as river rises and falls; there are two bench marks to control any movement, one reads 3.70 the other 7.05 metres.

Its zero is now inconveniently high and minus readings occur from the middle of March until June.

Sennar.—A similar gauge to that at Roseires, but without a bench mark.

Wad Medani.—A similar gauge to that at Roseires, its two bench marks read 4.00 and 10.00 metres.

At Dueim, 320 kilometres south of Khartoum, a temporary wooden gauge was erected in 1900. In April 1901 three lengths of a wroughtiron gauge were erected at 3 points on the sloping bank. During the autumn of 1902 one of these was knocked down and lost. It is proposed to build a masonry gauge at this point, but it has not yet been done.

At Taufikia 830 kilometres from Khartoum and just below the junction of the Sobat with the White Nile a wronght-iron gauge was fixed in April 1901, but in 1902 this gauge was moved to Fashoda where it was for some months in use.

In 18th April 1903 a new gauge was fixed. This was made of two 4-metre banks of teak each of which were unchored back into the bank with teak trestles, so as to lie approximately flush with the bank and so be protected from boats, hippopotami, &c. The upper surface is divided metrically, a brass mark being placed at each 5 centimetres. When in place the angle of slope is measured and the reading on the scale is converted to the vertical by multiplying it by the sine of the angle of slope. At Tanfikia a second sloping scale was erected above the first as the rise of the river was greater than could be recorded on one. The correction factors for these are 0.438 and 0.514.

A similar gauge was erected at the American Mission Station at Doleib Hilla at the end of April 1903, and in May Captain Wilson fixed a similar one at Nasser. In September 1903 a temporary wooden gauge was fixed at Glaba Shambe which will be replaced by a wrought iron one. Correction factor for Doleib Hilla 0.590.

At Mongalla on the Bahr-el-Jebel a teak sloping gauge was fixed at the beginning of April 1903 and has been regularly observed ever since. Correction factor 0.701.

At Gondokoro gauge readings exist since 1900, but the gauges have been lost or moved on several occasions. A sloping teak gauge was fixed on the 9th April 1903 and since then this has been regularly in use. As there is no little confusion in consequence of the various changes, the following history of this gauge is given.

Observations were commenced here on 6th December 1900 after those which had been taken further up-stream, at Fort Berkeley from 1st September 1899 to 2nd December 1900 were discontinued. The gange was a light wooden rod graduated in feet and inches. This may be called gauge A.

On 27th March 1901 a more substantial gauge of sheet iron screwed to a wooden upright which was strutted from the bank was fixed at the time of Sir W. E. Garstin's visit. \* This may be called B and was divided into metres and centimetres.

On the 13th November 1902 this was knocked down in the night and lost, and another, C, was erected on 18th November 1902 which was graduated in feet and inches.

To avoid the uncertainty caused by such frequent changes of gauge, on 9th April 1903, a sloping bank of teak was fixed parallel to the slope of the bank and firmly anchored back into the bank, so as to be out of the way of boats and hippopotami. This bank is graduated metrically and has a mark at each 5 centimetres. It is fixed at a slope of 60° so that its readings require to be multiplied by 0.866 to reduce them to vertical metres.

These changes may be tabulated as follows:-

GAUGE.	18	USE		
Cathe	from	tas	READING.	
A.	6.12.00	27.3.01	Feet and inches.	
В.	28.3.01	12.11.02	Metric.	
C.	18.11.02	8.4.03	Feet and inches.	
D.	8.4.03	to date.	Metric.	

<sup>.</sup> See Blue Book Egypt No. 2, 1901.

Thus there has been a constant record, except from 13th to 18th November 1902. The correction of these different series of gauge readings with one another is therefore most important.

On the 9th April D gauge was erected and read 0<sup>m</sup>48 or 1 ft. 7 in. while the C gauge which it replaced read 4 in., thus the readings of C gauge require an addition of 0<sup>m</sup>38 to reduce them to those of D gauge.

A difficulty arises now in connecting B gauge with C in consequence of the interval of 5 days between the loss of B gauge and the erection of C gauge.

The recorded readings converted to metres are as follows:-

1	902											metres
10	November		-		-			٠			٠	1.37
11	77	٠	٠	۰	۰			٠				1.42
12	77		٠						٠	٠	٠	1.50
13	2:	٠	٠		0	٠	0	۰	٠	0	٠	_
14	77											-
15			٠		٠			٠		۰	٠	_
16				٠	-							-
17	••	٠	٠		٠		٠		٠	٠		_
18	*9					٠	٠		٠			0.86
19	22				-	٠						0.84
20	97	0										0.84

Thus to reduce the B gauge readings to the C gauge the correction will be 0\mathbb{m}64 if there was no fall or rise in the river between 12th and the 18th of November.

Mr. Westry, who was the observer, has stated that he believes the river was stationary between these dates, but no note was made at the time. On the 28th March 1901 B gauge was fixed and read 0°30 when A gauge was reading 1 ft. 6½ in. thus the correction to correct its readings to those of B gauge is 0°16.

These corrections are given in the following table:-

49.450.00	Corrections to beduce to							
(iAuge.	A.	B.	C,	D.				
Α.	0	-0=.16	-0=.80	-0°.42				
В.	+0°.16	0	—()==,64	-0.26				
C.	+0=.\$0	+0m.61	0	+0=.38				
D.	+0°*.42	+0=.26	-0°,38	0				

There is no reason to believe, however, as stated above, that the river must have fallen in the interval between gauges B and C. The amount of the fall necessary to render the discharges which were taken in 1901-2-3 consistent, is 0<sup>m</sup>287. Since the river is falling in general in November, it is probable that its level was not maintained constant between gauges B and C. Moreover observations made by the flood discharge party in 1903 at Mongalla, Lado and Gondokoro show that the difference in level between the 1902 and 1903 floods was about 0<sup>m</sup>90, whereas the difference on the gauges is 1.24; thus additional correction of about+0<sup>m</sup>30 to gauge-readings on B and consequently A is thereby indicated.

H. G. LYONS,

Director General Survey Department.

# REPORT ON THE TECHNICAL DEPARTMENT

1903

BY

MD. ANIS PASHA,

CHIEF OF TECHNICAL DEPARTMENT.



## TECHNICAL DEPARTMENT

## YEARLY REPORT, 1903

## STEAM ENGINE SERVICE.

The work of the Steam Engine Service during the year 1903 was again satisfactory. The demands for Rokhsas were examined and either sanctioned or refused without any delay beyond what was necessarily occasioned by the ordinary procedure and routine of the Service, and the inspection was carried out without much of the former antipathy and evasions on the part of the owners, whether native or foreign.

Many of the owners have not only realised the necessity of keeping their plant in conformity with the conditions of safety laid down by the law, but have also recognized that it is to their benefit and interest to keep them in that state. Mr. Crawley, who has always tried to induce them to interest themselves in their machinery, reports some considerable progress in the general condition and upkeep of the engines and boilers, and a distinct improvement in the way they are now used and treated by the drivers, although as yet far from satisfactory.

The number of applications for Rokhsas for Industrial Engines received during the year 1903 was 359 as against 290 in the previous year. This number, together with 64 applications remaining for further consideration from 1902 and 35 received from the different Madiriehs for permits to allow irrigation pumping engines to be also used for industrial purposes, makes a total of 458. Of these, 362 were granted and 96 remained under consideration at the end of the year.

233 engines out of the 362 granted Rokhsas were submitted to the regulation, examination and test and having proved satisfactory, were given permits to work.

This number with 1056 sanctioned to work up to the end of the year 1902, makes a total of 1289 industrial engines working in conformity with the law up to the end of December 1903.

The number of visits of inspection made by the staff of the Service was 750, 233 for the above mentioned newly licensed engines, and the rest, 517, for either examining the machinery or testing the boilers of older established engines.

Besides the above, many irrigation pumping engines were also visited, either on account of complaints received, or at the request of the Inspectors of Irrigation.

I mentioned in my last report that the Steam Engine Service was called upon by the Inspectors of Irrigation on several occasions to examine or test old pumping engines complained of as being dangerous or in very bad repair, and that some of these engines were found in such a dangerous condition that the Service was obliged to stop them administratively after obtaining the consent of the Irrigation Service. I also remarked that Art. 6 of the Decree empowers the Service to examine and inspect all irrigation engines, and to prescribe to them any conditions it may deem necessary for the public safety.

In 1903, these calls for examination and test have considerably increased, and many of the engines inspected were found in a very bad and uncared for state and had to be stopped, either for repairs, or as unfit for use. Also, as soon as it became known to the public that the Technical Service was also dealing with the irrigation engines, many complaints were made against them, and engineers had to be sent to almost every part of the country to examine into the subjects of these complaints and report upon them to the Service upon which the necessary actions with respect to public safety are taken.

The deplorable state in which many of these engines were found, and the inconvenience caused by this cambersome system, suggested the expediency of taking immediate steps to bring them under the direct control of the Steam Engine Service, and to a certain extent subject them to the same regulations with respect to public safety as the engines in industrial establishments are now subjected to.

But as so much of the prosperity of the country depends upon these engines and no wholesale action can possibly be taken against them, any proposed change in their present state should necessarily be effected gradually and cautiously.

It was consequently arranged to deal first with the engines requiring new Rokhsas or old Rokhsas renewed and bring them at once under the control of the steam engine law.

The engines already established and duly licensed will have to be left to the care of the Service with the help of the irrigation officers to be dealt with in the way they have been during the last two years, and so get them improved bit by bit till in time all the dangerous ones disappear and the others come under proper control.

In dealing with the newly licensed engines, it has been arranged that from the beginning of 1904 all Rokhsas for portable as well as

for fixed irrigation engines must, after the consent of the Inspector General of Irrigation concerned, be issued from the Technical Service only and that even no temporary permit to work may engine shall be given without the intervention of the said Service.

Moreover, the Technical Service, by taking full advantage of Art. 6 of the steam engine law issued on the 5th November 1900 above mentioned, will insert in every Rokhsa issued or renewed the conditions of safety laid down by the said law, and deal with the engines, as far as public safety is concerned, in the same regular procedure as the engines in industrial establishment. Thus, no engine with a new Rokhsa or with an old Rokhsa renewed will, in future, be allowed to work before it is thoroughly examined and its boiler tested and pronounced in a safe working condition.

By this means, we shall not only be sure of the newly liceused engines, but also a stop will be put to the great abuse now practiced of buying old boilers which the Service had condemned as unfit for use in industrial establishments, such as mills, etc., and using them for irrigation purposes, simply because there has been no technical inspection of irrigation engines.

Also, as the Rokhsas will be registered in the books of the Service the owners will be directly under our control in matters of contravention and can easily be dealt with according to the law.

During the year the Service was more than once asked to examine and report on river steamers, but could not comply owing to the Decree of the 5th November 1900 having no provision for steam boats. A special project, therefore, is now being prepared by the Technical Service with the intention of its forming a part of a General Laylar for river navigation which the Ministry of the Interior is desirons should be put into force.

The number of process-verbanx of contravention drawn up against engine proprietors during the year was 49, of which 41 were submitted to the Native Courts and 8 to the Mixed Tribunals.

In the Native Courts 11 proprietors were sentenced to stop their engines, 2 were fined and one was acquitted. Of the remaining 27 cases, one was withdrawn by this Service and 26 were still in court at the end of the year.

In the Mixed Tribunals 6 proprietors were condemned to stop their engines, and 2 were still awaiting trial at the end of the year.

From the above it will be seen that the judgments in both Courts were on the whole very satisfactory. This is owing to the Layha being better understood and the cases better pleaded by the Parquet.

Three boiler explosions took place during the year, one at Dishma, another at Minia, and another at Corashia.

The explosion at Dishna was a very serious one, causing the loss of 4 lives and serious injury to 3 people.

This boiler was very old and its proprietor was warned of its bad state by the Service which ordered him not to use it until it was thoroughly examined and tested. He, however, took no heed of this order and worked it without the knowledge of the Service with this unfortunate result.

On examination of the boiler at the scene of the explosion the cause of the accident was found to be excessive corrosion from old age.

At Minia, the explosion was of the boiler of an agricultural locomotive 31 years old belonging to the Société des Sucreries. It occasioned the death of two persons and badly injured one.

Owing to all traces of evidence being removed from the scene of the explosion the exact cause could not very well be ascertained, but as it appeared that the loads on the safety valves were not altered to suit the great age of the boiler the explosion was undoubtedly due to over pressure.

At Corashia the exploded boiler was a Cornish one that supplied steam to an irrigation fixed engine. The explosion was due to shortness of water, and caused the death of the engine driver.

40 Rokhsas for irrigation fixed engines were given from this Service during the year; 29 for new stations and 13 in exchange for old Rokhsas. The fees received for these Rokhsas came to L.E. 348,500.

The total number at the end of 1902 was 816. Of these, 14 were cancelled and 803 remained. This number with the 40 new Rokhsas, make the total number of Rokhsas in hand at the end of the year 842. Their distribution among the different irrigation Circles is as follows:

	in land to end of 1902	Cancelled in 1903	Given in 1993	In hand to and of 1903
Ist Circle	226	10	13	233
2nd ,,	320	3	11	328
3rd ,	105	_	1	106
4th .,	130	2	7	135
5th ,	24	_	_	24
Girga Directorate	8	1	()	2)
Delta Barrage Directorate	3	•)	4	5
Assyut Barrage Directorate	_	_	2	2
	816	14	4()	842

The staff of the Steam Engine Service is totally inadequate for the heavy and increasing duties it is now called upon to perform, and in spite of the continuous efforts of Mr. Crawley and his assistants, I feel that before inspections and tests can all be efficiently and expeditiously carried out, it is absolutely necessary that the staff should be increased.

Great praise is due to Mr. Crawley for the manner in which he and his small staff have carried out the work of this Service during the year with such satisfactory results.

### QUARRIES SERVICE.

The total number of Rokshas for quarries, in Cairo and its vicinity, at the end of the year 1902 was 613, of which 126 were given for life and 487 for a term of ten years.

During the year 1903 the Service cancelled 73 Rokhsas, 7 of the former and 66 of the latter class, while 43 new ones were granted. The total number in hand at the end of 1903 will thus be:—

The fees received for the new Rokhsas amounted to L.E. 1195,590 Milliems.

The different localities of all the licensed quarries under the control of this Service, and the time of expiry of their Rokhsas are shown in the annexed table.

## CENTRAL STORES

## I.—ARTICLES PURCHASED OR MADE.

(	A) I	nstrumeni	ts and	camp	equi	pments.
---	------	-----------	--------	------	------	---------

(A) Instruments and camp equipments.
Purchased from Europe { England 427 939 France, 120 432 I.M. M. 548 371
Made by Govert Services { War Office 277 659 53 817 331 476
Purchased in Egypt   from Govert.Services   166 539   123 901   190 440   LE. M.
(B) Furniture. ————————————————————————————————————
Made by Govert. Services   Guizeh Water Service   21 117   3 905   Arsenal   82 195   107 217
Purchased in Egypt   from Govert Services   108 700   from the market     139 020
$\phantom{00000000000000000000000000000000000$
II.—REPAIRS TO INSTRUMENTS.
Repairs made at the Arsenal
Total L.E.1744 827 III.—ARTICLES ISSUED AGAINST PAYMENT.
To the Irrivation Department
Building and Tanzim
" Nile Steamer Service
## Sudan Government ## \$ 400  ## Sanitary Department ## 0 876  ## Messrs. Dupuis and Crawley ## 14 484  ## Merchants in Cairo ## 0 300
Messrs, Dupuis and Crawley 14 484
Merchants in Cairo 14 484
302 044
IV.—Orders given to the Stores.
For issue of articles to Governt. Services 197 000 16 000
213 (00)
For receipt of articles returned
161 (XX)
The value of the articles delivered from the Stores and charged to
the Budget was L.E. 1563.229 distributed as follows:—
Icrigation Department 816 634
Building and Tanzim
Technical Service
Reservoirs Service
Survey Department 88 818
Total L.E. 1563 229

### ARSENAL AND BOATS.

The work executed in the Arsenal workshops, and the materials delivered from its stores during the year 1903 amounted in value to L.E. 21327 as against L.E. 28357 the year before.

Most of this amount or 89.4°/, of it was charged to the different branches of this Ministry, the rest or 10.6°/, was charged to other Government Departments and private individuals, shown as follows:—

	1903	1902
	L.F.	L.E.
Value of work executed for P.W.D	17021	22504
Cost of coals and engine room stores for steamers	2031	2748
Total for P.W.D	L.E. 19052	25252
Value of work and meterials for other Govern-		
ment Departments Value of work and materials for private indivi-	2028	2966
duals	247	139
Grand Total	21327	28357

The distribution of the above amounts is shown as follows:-

# SUM CHARGED TO THE DIFFERENT BRANCHES OF THE MINISTRY OF PUBLIC WORKS.

distant of lobble works.	
1903	1902
L.E.	L.E.
Irrigation Services	15328
Reservoir Service	146
Building and Tanzim Department 638	671
Survey Department 1252	1646
Administrative Service	
Technical Service 346	
Repairs to steamers and maintenance of Arsenal	<b>'</b>
plant 3546	4343
Management of the second of th	
Total L.E. 17021	22504
Sum charged to other Government Departments:-	
1903	1902
LuE.	LE
Ministry of Justice 10	325
Finance 49	245
" Interior 325	211
" Public Instruction 169	111
War 45	_
Army of Occupation 11	55
Sanitary Department 360	928
Mudiriehs, Governorates and Town Councils 208	405
Khedivial Yachts 3	107
Model Workshops 848	560
Wakf Administration.	19
TI MAI ZAMINIMANIGATION	

Total ...

L.E. 2028

9966

The charge against the Irrigation Circles was much less this year than the year before. It amounted, as shown before, to L.E. 11188 in 1903 as against L.E. 15328 in 1902 or less by about 27°/<sub>o</sub>.

The main items in this charge were for :-

459 tons of steel pipes costing L.E. 5840 as against 671 tons at L.E. 8232 the year before.

119 tons of cast iron grooves costing L.E. 1259 as against 163 tons at L.E. 1766.

1780 pieces of regulating timbers at L.E. 1104 as against 3680 pieces at L.E. 2720.

Also L.E. 1211 for galvanised iron pipes imported for 2nd Circle, L.E. 299 for building new hull for steam launch "Yemkin" belonging to 1st Circle and repairing a lock gate for Ismailia canal, L.E. 121 for making grid irons and some castings for Etsa pumps, and L.E. 1354 for miscellaneous work and stores.

The quantity of work executed for the Building and Tanzim Department is practically the same as last year. This work consisted of:—

(T) (1 A (1) 1 1 1	-70.0						L.E.
Castings for Ghiseh and	Ghe:	sireli	pili	II lie		 	 180
Tree guards and grids						 	213
Repairing carts							90
Making new carts							30
wooden railings.	etc.		0 + +			 	 45
wooden railings. Miscellaneous work						 1.7.4	 80
				1	utal	 	 L.E. 638

The Survey Department was supplied with angle iron triangulation marks for L.E. 766, and technical apparatus, office furniture and fittings, and sundry other work for L.E. 486.

The Administrative Service was charged L.E. 51 mainly for office furniture; and the Technical Service L.E. 346 for instruments and instrument repairs for the Central Stores.

The main items in the charge against the other Government Departments were for:—

Repairing steamers of the Ministry of the Interior Making examination tables for the Ministry of Public	308
Instruction  Making dust bins and carts for the Sanitary Department  carts for Municipalities and Town Councils  Erecting machinery and doing other work for Model	151 335 118
Workshops	777 339
Total L	E.2028

Very little was done to the Arsenal workshops this year.

The shop engines and some of the machine tools were repaired, the hand tools replenished, the portable engine and cranes in the yard overhauled and adjusted and some of the walls restored.

Of the floating plant, some of the rowing boats, barges and lighters, a house boat, and a landing stage were also repaired. The total cost of this amounted to L.E. 633 which was paid from the Arsenal profits.

Also, some spare articles and tools which cost L.E. 398 and paid for from the Budget were made in the shops and kept for the Arsenal in store.

The cost of materials bought for the workshops and steamers, exclusive of coals, amounted to L.E. 9802.

Of this amount, materials to the value of L.E. 7754 were taken from local merchants or imported from Europe through local agents, and L.E. 2048 ordered direct from Europe by the Service.

The total quantity of coals bought during the year amounted to 39050 kantars and cost L.E. 2838. Of this quantity, 26055 kantars costing L.E. 1520 were delivered direct to the Arsenal stores and 12995 kantars costing L.E. 1318 were taken from Cook's and the Daira Sania's and other coaling stations for the use of steamers when in commission.

The total amount spent on materials and coals during the year was thus L.E. 12640.

The quantity of stores issued to the workshops and stemners amounted in value to L.E. 13739, shown as follows:—

				L.E.
Value	e of	materials used in workshops		11818
29	jn	deck stores for steamers		778
29	4.9	deck stores for steamers		430
6-2	**	engine room stores for steamers		212
99	9.9	coals for steamers		501
		Total value of quantity issued		L.E.13739
Addi	ng v	value of coals taken from coaling stations		, 1318
		Total value of uniterials, etc	• • •	L.E.15057

The total cost of labour, which is nearly all native, amounted to L.E. 4538.

From the preceding statements it will be seen that most of the work executed in the Arsenal was for the Irrigation Circles and it mainly

consisted of the usual type of work such as sleepers, grooves, pipes, etc. The variation in the cost of the sleepers is very little; it depends on the price of wood which has been constant for the last two or three years. The quality of the work of preparing them does not call for any remark being every-day work well understood by the men.

The average cost of grooves has also remained unchanged. It is L.E. 9 per ton of ordinary grooves, and L.E. 10 per ton of grooves

with cast strips requiring planing by machine.

Since the introduction of the hydraulic rivetting machines in the Arsenal the rate of cost of iron work has gradually been reduced. In speaking on this subject in my last report I said "the Arsenal has, in my opinion, reached the limit of economy of labour on this kind of work and any further reduction of the cost must be looked for from the prices of materials." This year steel plates were bought at the average price of L.E. 7.90 per ton and coals at L.E. 1.30 per ton as against L.E. 8 and L.E. 1.35 per ton respectively in 1902, and rate of cost of steel pipes came to L.E. 12.25 per ton as against L.E. 12.27 per ton, which is practically the same.

Also, the rate of labour per ton came to L.E.1.38 as against L.E.1.49. This slight reduction in the rate of labour is owing to a small hydraulic rivetter made at the Arsenal and used this year in rivetting small pipes down to 0<sup>m</sup>75 diameter.

This small tool has not only afforded great facility in making the small pipes which were formerly made by land under some difficulties, but also stopped the complaints we used to receive of this class of work.

In concluding my remarks on the workshops I should note the satisfactory state of the carpenters and joiners shop which is always kept busy and turns out excellent work.

Before high Nile every steamer was, as usual, thoroughly overhauled and repaired or furnished as required.

The total expenditure on the steamers during the year came to L.E. 6505.

Of this sum L.E. 2033 was spent on repairs, and deck fittings and stores, L.E. 2031 on coals and engine room stores, and L.E. 2441 on the crews. This is shown in detail in the following statement:—

STEAMERS.	Repulrs.	Desk tittings and Stores.			Total.	
	1-17, M.	LE M.	1.E. M.	L.E. M.	L.E. M.	
Nasratieh Messir Tohta Kahira Bulak	271 275 45 497 136 466 96 624 0 070	60 116 40 086 51 985	234 372	375 313 144 100 319 753 170 912 219 000	971 994 484 085 614 180 488 150 554 737	
Refik Dendera	96 998 74 386	46 142 28 274	208 963 399 496	198 397 264 492	550 500 766 648	
Rekib          Tawaf          No. 1          Moeris	91 717 137 590 545 571 30 938	40 868	_	185 763 208 297 96 912 63 772	416 019 455 380 642 483 166 157	
No. 74 No. 25 Dredger No. 206	20 850 0 400 55 237	5 743		54 675 88 645 51 000	90 835 170 573 133 549	
Total	1,603 G19	429 829	2030 811	2441 031	6505 290	

Of this total expenditure the sum of L.E. 5794 was paid from the Budget, L.E. 37 from the Arseml profits, and L.E. 674 was received for coals and engine room stores consumed by steamers when lent.

On examining the boats after their return at the end of the flood season the Nasratieh was found to be unfit for any further service. Her engines and boiler were found to be in a very serious condition and incapable of repair. She is now laid up until money is available to buy her a set of engines and boilers.

Her hull and her aft saloon fittings are in a very good state having been thoroughly repaired and done up only three years ago, and in my opinion, if she is fitted with light modern compound engines and the roof of her forward saloon and cabins, which is rather low, is raised she will be one of the best steamers in the Service.

The Tawaf was also found to require replating almost throughout and some of her frames renewing. She was therefore taken in hand at once and is now nearly finished.

The aft cabin on the stern has been removed and the deck made flush as was done on the Refik and Rekib, and instead of the deck being single it has been made double, not only to render the cabins much cooler by allowing a current of air to pass between the decks, but also to allow any of the deck boards to be replaced without destroying the ceiling of the cabins.

Her boiler which was rather small for her engines has been replaced by a new one of a larger size which was ordered from Europe for Tug No. 1. This boiler will be able to supply the engines with sufficient-steam and the speed of the boat will probably be increased one or two kilometres per hour.

The cost of all this work with the price of the boiler was estimated at L.E. 700.

Tug No. 1 was laid up in 1902, on account of the dangerous state her 40 years old boiler was found to be in, and a new boiler was ordered for her from England. On the arrival of this boiler, however, it was decided to put it in the Tawaf and put in No. 1 a suitable new boiler that was found at the Barrage.

Owing to the want of sufficient steamers for inspection during flood it was decided to convert No. I into an inspection boat, and I hope in a short time she will be finished. The estimate for this work was about L.E. 250 (boiler not included).

We have now in course of construction a new tag boat to replace No. 1. This boat, which is built after the lines of the Barrage tag No. 30, will be propelled by an old engine taken some years ago out of the s.s. Juffa and kept in the Arsenal stores, and the boiler lately taken out of the Tawaf will be utilised to supply this engine with steam. The total expenditure on this boat is estimated at L.E. 450.

In closing this section of my report I should like to add that Mr. Curtis has performed his duties in an efficient and satisfactory manner, and the work turned out under his supervision, speaks, as in previous years, very highly of him and also of the staff and men under his charge.

M. ANIS, Chief of Technical Department.

Cairo, 14th April, 1904.

## QUARRIES SERVICE.

## YEARS OF EXPIRY OF ROKHSAS.

Locality.	11003	11035	114/43	1907	1ture	1900	1910	1911	1912	1913	1929	Rokbana for life.	Total.
		-										_	
1.—Stone and balat quarries.													
Helwan Ma'eara (el) Tura Hashmy (el) Messan (el) Eyonn Montser Harif (el) Emara (el) Motablak (el) Taidita (el) Bassatin (el) Atar el Nabi Batu el Bakara Ein el Sira Abiu el Seonal Zawiet Nuera Abiud (el) Ma'daesa (el) Deweika Ahmar (el)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 2 3 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		45   2	10 1 2 6 1 5 5 5 5 1 1	3521   21   22   20   10   22	6-	1 1 1 1 2 1 1 2 1 1 2 1	3 1 1 1 1 1 1 2 2 2 2 2 2 2 1 2 1 1	10		1	46 46 22 54 47 50 40 30 19 19 19 19 19 19 19 19 19 19 19 19 19
Abluraich (cl)		=	=	=	=	_	=	1	=	Ī	=	-	2
(luziani (el)	-	=	=	=	=	_	=	_	=	"	_	=	2
11.—I'abble, stone and sand quarries.													•
Rab-el Nasr		-	-	-	-	-	-	-	-	-	-	_	-
Hassatin (cl)		2	1	1	=	y	8	6	62	5	_	=	45
111.—Gathering of gypsum.													
Fr. Helwan to Knyed Bey, lize	. 2	-	-	-	-	-	-	-	-	-	-	-	2
IVExtraction of clay.													
Ma'ssam (cl)	-	-	-	-	-	-	-	-	-	-	1	-	1
	-	-	-	-	-	-	-	-	-	-	-		
Total	. 31	37	52	50	61	48	11	46	25	10	1	119	583
	-	1		1	1 =	1	4	1	ī	1	-		



# RAPPORT DU SERVICE DES ANTIQUITÉS

POUR L'EXERCICE 1903

PAR

G. MASPERO



# RAPPORT DU SERVICE DES ANTIQUITÉS

### Pour l'Année 1903.

#### I. — SERVICE ADMINISTRATIF.

L'augmentation totale de notre budget régulier a été, pour l'exercice 1903, de L. E. 784: elle n porté pour L. E. 484 sur le personnel classé, et pour L. E. 600 sur le personnel non classé. Elle nous a permis d'amélierer le sort de quelques-uns de nos petits employés et de perfectionner la marche des uffaires sur plusieurs points; toutefois nous ne sommes pas encore organisés aussi complètement qu'il serait nécessaire et nous serons obligés de demander à l'État quelques légers sacrifices de plus, afin d'assurer partout le fonctionnement exact du Service.

Inspection du Directeur général. — Elle a été retardée par suite d'un accident survenu au remorqueur n° 1, que le Ministère met d'ordinaire à ma disposition. J'ai dû loner à la Compagnie Cook un de ses remorqueurs, et bien qu'elle ent consenti graciensement à baisser ses tarifs, il m'a fallu changer mon programme : je suis remouté à la vapeur jusqu'à Assouan, sons m'arrêter nulle part, puis, renvoyant le remorqueur, je suis redescendu vers le Caire à la rame et à la voile, si bien que l'inspection de cette année n'a pas coûté plus cher que celles des unnées précédentes. Elle a duré deux mois, du 3 janvier au 8 mars, et, malgré les leuteurs de la navigation, elle a donné des résultats satisfaisants. Entre Philæ et Edfon, j'ai pu visiter les carrières d'El-Khannakah, les ruines voisines du village d'El-Hagar, et le petit temple romain de Resrâs, que j'ai retrouvés tels que je les avais comms autrefois. Par contre, les restes de la ville byzantine et arabe de Bonéib ont été fort endommagés lors de la construction du chemin de fer d'Assouan: la partie basse de la ville a été démolie par les ouvriers, y compris une moitié de la basilique, et, scule, la ville hante demeure à peu près intacte avec son donjon et ses remparts. La grotte des Crocodiles, près de Maabdeh, n été sacragée sans pitié après 1886; les momies ont été mises en pièces, et des incendies, allumés par l'imprudence des chercheurs de papyrus, ont détruit le contenu de galeries entières. La plupart des autres localités situées entre Siont et Miniéh, Cosséir el-Amarna, Hudji-Kandil, Berchéh, Cheikh-Abadéh, ont moins souffert; toutefois, les ruines de la ville romaine située au Kom el-Ahmar, près de Zaouiét el-Amonat, ont reçu dans ces derniers temps la visite des marchands de Mellaoui. L'inspecteur du Service, Sobhi Effendi Arif, prévenu en temps utile, a saisi quelques masques en plâtre d'un bean style et d'une conservation excellente, mais d'autres objets ont échappé à ses recherches et sont encore sur le marché occulte des antiquités.

L'état des grands édifices ne s'est pas modifié sensiblement depuis l'an dernier. J'ai eu pourtant le regret de constater, lors de mon passage à Thèbes, que deux des colonnes encore debout dans la région septentrionale de la Salle Hypostyle menaçaient de s'écrouler, ninsi que les architraves brisées qu'elles sontenaient : ordre a été donné aussitôt à M. Legrain de tout préparer pour les démonter et pour en refaire les fondations pendant l'hiver de 1903-1904. J'ai reconnu également que le petit temple de Déir el-Médinéh exigenit une restauration sérieuse : il faudra déposer la porte de l'enceinte, dont les fondations ont cédé, et probablement reprendre l'une après l'antre toutes les colonnes de la cour et du pronaos. Le temple de Gournah, lui aussi, semble être parvenn à terme de résistance, et bien des touristes ne s'aventureraient pas dans les salles s'ils soupçonnaient la condition précaire de plusieurs des colonnes et des murs. M. Barsanti, que j'ai chargé de l'examiner à fond, a conclu comme moi à la nécessité d'y opèrer des travaux considérables dans le plus bref délai. Le manque d'argent nons a arrêtés au cours de cette année, mais, aussitôt que la consolidation de l'enceinte d'Edfou sera terminée, M. Barsanti ira commencer celle du temple de Gournah. Je crains que ce ne puisse pas être avant 1905 au plus tôt.

Travaux des inspecteurs en chef. — J'ai montré déjà combien il était nécessaire aux inspecteurs en chef d'avoir auprès d'eux quelques employés chargès de leur comptabilité et de leur correspondance tant avec l'udministration centrale qu'avec leurs inspecteurs locaux et avec les agents des antres administrations égyptiennes. M. Quibell, qui réside au Caire, a pu utiliser le personnel du Musée pour les affaires de son inspectorat, mais M. Carter n'a pas la même ressource, et, cette aunée, j'ai dû continuer de lui adjoindre à titre provisoire deux secrétaires, dont l'un, Tewfick Effendi Bonlos, est payé à raison de L. E. 60 par an sur les fonds de touristes, tandis que l'autre, Chehatah Ayonb, touche un salaire de L. E. 36 sur le chapitre des indemnités. Notre budget ne nous permet pas de faire davantage, mais le moment approche où il faudra doter l'Inspectorat du Said d'un personnel plus nombreux et mieux rétribué: prenant en considération le nombre toujours croissant des affaires, j'estime que ce ne serait pas trop de deux bons employés à

demeure, un secrétaire-interprète, qui suivrait l'inspecteur dans ses tournées, et un comptable, tous les deux inscrits dans le cadre.

1º Inspectorat du Sud. — Jusqu'à présent, l'Inspecteur du Sud avait résidé sur la rive gauche du Nil, dans la maison bâtie par le Service il y a une douzaine d'unnées lors du déblaiement de Médinet-Habou: l'éloignement du site et son isolement m'ont décidé à transporter le siège de l'administration sur l'antre rive du Nil. Un emplacement nous a été concédé par le Ministère des Finances, à petite distance au nord de Louxor, entre la route de Karnak et le fleuve, assez vaste pour contenir la maison de l'Inspecteur, les bureaux de l'Inspectorat et un magasin d'antiquités. La construction a été commencée en octobre dernier, sur des plans dressés par M. Baraize et appronvés par la Direction des Bâtiments civils: par décision du Comité d'archéologie, la dépense sera imputée sur le fond des touristes et répartie entre plusieurs années. D'octobre à fin décembre M. Baraize a construit les bureaux et l'écurie, le tout représentant une somme d'environ L. E. 450; les travanx de la maison d'habitation ne commenceront qu'au mois d'avril 1904, lorsque nous saurons à peu près quel a été le rendement des cartes de touristes.

La lumière électrique a fonctionné pendant tout l'hiver dans la Vallée des Rois, sans accident ni à-coups : nous n'avons pas été obligés de recourir une seule fois aux lanternes préparées dans chaque tombeau, en vue d'une extinction subite des lampes. La machine a été démontée an printemps, puis revue pièce à pièce, et elle n'a été remise en marche que dans les premiers jours d'octobre, lors du retour des touristes. L'expérience de cette année nous n révélé, comme de juste, quelques légers défauts de l'installation: nons avons reconnu, par exemple, qu'il y avait avantage à conserver toujours sous la main une provision d'ean plus forte, et nons avons njonté deux réservoirs nouveaux unx deux que nons avions jugés suffisants d'abord. Il nons a fallu aussi modifier un peu la composition de notre personnel d'électriciens et engager de ce chef une dépense un peu plus forte; mais, d'autre part, les frais de production et d'entretien sont montés beauconp moins haut que nous ne l'avions pensé, ce qui nons a permis d'opèrer cette modification sans dépasser, et même sans atteindre, nos prévisions. Le résultat a donc été heureux en tout sens, et il m'a encouragé à user du même mode d'éclairage dans d'autres localités. En attendant que nous l'appliquions au Sérapénni et aux tombenux de Sakkarah, j'ai ouvert des pourparlers avec la maison Cook pour l'installation d'un réseau à Ibsainboul, et j'ai tout lieu de croire que l'aunée 1904 ne s'écoulera pas saus que le spéos de Ramsès II soit éclairé à l'électricité.

Le parc à bandets construit dans la Vallée des Rois ayant été d'une véritable utilité pour les âniers et pour leurs bêtes, il m'a paru bon d'en établir de pareils dans tous les endroits qui sont visités par les touristes en bandes. Nous en avons installé déjà plusieurs dans les localités de la rive gauche, à Déir el-Bahari, au Ramessèmu, à Médinet-Habon: la magonnerie en est achevée, et ils scront couvert dans le courant de l'au prochain. Nous en ferous antant à Karmak, dès qué le débluiement sera avancé suffisamment.

La surveillance des momunents n été aussi pénible que les nanées précèdentes: l'attaque dirigée en 1901 sur le tombeau d'Aménôthés II est demeurée impunie, ainsi que le vol d'une quantité de pièces d'or découvertes à Karnak. Les procès intentés on sontems par le Service contre les particuliers qui usurpent les terres antiques appartenant à l'État sont de même restés stationnaires: le plus important de tous, celui que nous avons avec Khalafallah bey au sujet de terrains à sébakh de Haou, est toujours pendant devant le tribunal de Kéneh, bien que les expertises aient jusqu'à prèsent tourné à notre avantage. Enfin, dans certains eas, à Erment, par exemple, où les tribunaux avaient décidé en notre faveur, nous n'avons pas encore obtenu l'exécution du jugement.

Les travaux de réfection et de fouilles entrepris par M. Carter ont marché régulièrement. A Thèbes, le déblaiement du Ramesseum a continué avec le concours de M. Baraize ; une partie des édifices et des vontes en briques qui entourent le temple à été débluyée, et les décombres out été amoncelés régulièrement le long du fossé d'enceinte pour protéger l'uire mise au jour. A Médinet-Habou, la prise du sébakh a été dirigée de manière à dégager le unir antique, dont nous comptons utiliser les restes afin de clore le téménos du temple. En décembre 1903, une porte en grès y a été déconverte par les fellalis, sur laquelle les scènes et les inscriptions n'étaient ni sculptées, ni peintes, mais constituées par des combinaisons d'émanx incrustés dans la pierre : une partie des pièces d'émail a été détournée par les preneurs de séluikh, mais nous avons par en racheter la plus grande partie, et j'espère rétablir le monument presque en entier au Musée du Cuire. D'autre part, les fouilles commencées par M. Carter en 1902, à la Vallée des Rois, ont amené, pendant les derniers jours de janvier 1903, la découverte du tombean de Thoutmôsis IV. Le mobilier funéraire avait été mis en pièces par les voleurs antiques, et les débris en gisaient épars sur le sol, mais les peintures des chambres et le sarcopluge sont intacts. Les débris, recueillis et classés par MM. Carter et Newberry, sont anjourd'hui au Musée, à l'exception d'un petit nombre de pièces dont le

Service a fait hommage à M. Davis. Le tombeau de Thommosis IV vidé, M. Carter a transporté les onvriers dans un endroit voisin, où certaines indications nous engagenient à chercher le tombeau de la famense reine Hatshepsouiton. Les fouilles, menées cette fois encore aux frais de M. Davis, sont plus pénibles que nous ne nous y uttendious. Le couloir, d'une pente très raide, a été vidé sur une longueur d'environ 180 mètres, sans que nous soyons encore parvenus à la chumbre funéraire, et la chaleur y est si suffocunte que nous devons envoyer sans relâche de l'air frais aux ouvriers au moyen de la pompe achetée magnère par M. de Morgan : nons étions descendus sons le temple de Déir el-Bahari dans les derniers jours de décembre, sons que mil indice nons montrât que nous approchions de la fin, mais la dureté et la composition des remblais prouvent qu'ils n'ont pas été remaniés depuis une époque fort aucienne. Il est évident que l'architecte pharmonique a voulu placer la chambre funéraire derrière la stèle qui décore le fond de la chapelle du sacrifice, dans la partie méridionale du temple de Déir el-Bahari, et c'est derrière cette chapelle, on à pen-près, que nous nous attendons à trouver le sarcophage de la reine au cours de l'année 1904. En inspectant le même quartier de la Vallée, il m'a paru reconnaître deux points on se cachent des tombes encore incommes, peut-être celles de Thoutmòsis II et de Il rihorou: M. Carter y transportera ses chantiers, sitôt que la fouille actuelle sera terminée.

2º Inspectorat du Nord. — Comme d'ordinaire, M. Quibell a en plus d'affaires contentienses à régler que de travaux scientifiques à exècuter. L'exploitation à outrance des tells du Delta par les preneurs de sébakh amène eluque unnée la déconverte de menus objets, de monuaies, de statues, que nos gardiens saisissent rarement, mais dont la saisie, lorsqu'elle peut avoir lieu, entraîne presque toujours un procès; de plus, les parties de tells épuisées sont usurpées par les propriétaires voisins, à mesure qu'ulles descendent à peu près un niveau du terrain environnant. M. Quibell a défendu de son mieux les droits du Service, qui sont ceux de l'État Égyptien, et cette tâche ingrate à consumé le meilleur de son temps. Il a continué la consolidation du temple d'Abydos, et il n'achevé la fouille commencée par M. Dove Covington dans le champ des Pyramides de Gizèh : il sera question plus loin de cette dernière affaire.

Inspecteurs indigènes, rèss et ghațirs. — J'nvais demandé que les salaires des inspecteurs indigènes fussent relevés; le Ministère des Finances a bien voulu me donner satisfaction partielle sur ce point. Grâce à la transformation d'un poste d'inspecteur de troisième clusse en

un poste d'inspecteur de première, nous avons pu récompenser l'un de nos meilleurs officiers, Aly Effendi Habib, du zèle et de l'activité qu'il déploie depuis vingt-cinq aus pour la cause des Antiquités. L'inspecteur d'Assonan et d'Edfou, Mahmond Effendi Mohammed, a été promu à la seconde classe, et nous avons accordé un nouvel inspecteur de Gournali, Monrsi Effendi Halim, un traitement d'entrée plus élevé que celui qui est alloné d'ordinaire aux inspecteurs nouveaux. Dans le Delta, la mort de M. Botti nous a obligés à rénuir provisoirement le petit inspectorat d'Alexandrie à l'inspectorat de Gharbieh. Dans l'Egypte Moyenne, Mohammed Effendi Chabân et Sobhi Effendi Arif out permuté, le premier passant an Fayoum, le second à Minich-Assiout. L'exploration systèmatique du Fayoum par les savants européens, venant après l'exploitation dévastatrice des fouilleurs illicites, y a épuisé la plupart des unciens sites, et la vente on la mise en valeur des terrains du Convernement a diminué considérablement les espaces à surveiller : le Fayoum convenait donc à un inspecteur fatigué, tel que Mohammed Effendi Chabân. Au contraire, les deux mondiriels de Siont et de Miniéli out vu se multiplier depuis quelques aunées les clumps de fouilles, et quelques-unes de leurs villes, Mellaoui, Siout, Gaou, sont devenues des centres importants de recel et de trafic clandestin. Le transfert de Sobhi Effendi dans cette région menacée a produit aussitôt des effets heureux: il ne faut pas nous dissimuler ponrtant que la lutte sera longue, et que des aimées probablement s'écouleront avant que nous ayons en raison de ces marchands, anxquels les lois actuelles assurent presque l'impunité.

La situation et le nombre des nos ghafirs et de nos réis ne changent pas sensiblement. J'ai pu porter à L. E. I par mois tous ceux d'entre eux qui ne touchaient pas cette somme, mais l'ensemble des salaires demeure insuffisant, si l'on considére le travail ardu que nous exigeous de ces gens et les responsabilités qu'ils encourent. Le tableau suivant en montrera le nombre et la répartition sur le territoire égyptien, ainsi que la quotité de leur solde et les fonds sur lesquels elle est imputée:

INSPECTORATS.	Nomber.	Surch lart.2 Personnel Rors endre	surch, lart. 1 Foultles.	Fonds des Tenristes.
Inspectorat du Nord :		L.M. M.	1 18.	LPL M.
Ménoufiéh-Galionbiéh Charkiéh-Dahkalieh Gharbiéh-Béhéra Fayoum-Béni-Souef Miniéh-Siont Girgeh	2 10 5 21 32 13	12 96 36 195 108 36	12 12 24 72 36 24	12 
Inspectoral du Sul:  Dendérali	12 16 34 25	24 12 12 12 108	12 141 —	110 400 186 272 400 180
Relevant du Musée directement : Gizéh	i i	36 43 200 223 800		72 66 349 200
Total	221)	942	336	1611

Les provinces de Miniéh et de Siont ont bénéficié de la meilleure partie de l'augmentation : elles ont requineuf ghafirs nouveaux et je prévois qu'elles en exigeront d'autres. Il nons faudra instituer une cinquantaine de postes environ pour compléter la surveillance de l'Égypte entière. J'ai dû ajouruer cette création, faute d'argent; en revauche, j'ai nomme dans chaque circonscription un chef-ghafir, dont les appointements sont un peu plus élevés que ceux des ghatirs ordinaires. Depuis que, sons l'impulsion des inspecteurs en chef, les inspecteurs locaux out manifesté une activité toujours plus grande dans l'exercice de leurs fonctions, j'ai reconnu qu'ils devaient avoir toujours sous la main un homme de confiance, qu'ils pussent mander d'urgence dans les localités où ils étaient empêchés de se rendre eux-mêmes, ou qui les accompagnat dans leurs roudes et leur prétât main forte au besoin, lorsqu'ils seraient obligés d'arrêter que que fouilleur illicite. J'ai donc placé d'abord des chefsglufirs dans deux inspectorats, celui du Fayoum et celui de Siont, pendant le cours des deux nunées dernières; les résultats obtenus m'ont engagé à généraliser l'institution, et, depuis 1903, tous les inspecteurs ont un chef-ghafir attaché à leur personne.

Loi sur les Antiquités. — Le projet de loi qui avait été établi d'accord commun entre le Service, le Comité d'Archéologie et Mr. de Roccaserra, a été de la part du Comité de Législation l'objet d'une révision minutiense, à la suite de laquelle une troisième rédaction en a été donnée par les soins de M. Brunyatte. Tontefois, avant de le présenter à l'approbation de S.A. le Khédive et du Corps Législatif, le Comité de Législation insista pour qu'il fût soumis aux puissances, en vue d'une application immédiate aux étrangers qui résident en Égypte, bien que, dans l'origine, il dût toucher les seuls indigenes. Une tentative dans cette direction, faite officiensement aux mois d'noût et de septembre, aboutit, comme on devait s'y attendre, à une fin de non-recevoir; et les choses en sont au point même où elles en étaient avant la démarche. Nous attendons que les autorités compétentes se soient décidées soit à promulgner le dernier projet sous une forme plus on moins modifiée, en l'appliquant aux sculs indigènes, comme je le propossis, soit à en remettre la promulgation à des temps meilleurs, et à laisser le Service se débattre péniblement contre les volcurs et contre les destructeurs des monuments.

### H. — LES FOUULES ET LA RÉFECTION DES MONUMENTS

Comme d'habitude, je me borneraià indiquer sommairement les localités explorées par les savants étrangers et les résultats principaux qu'ils v ont obtenus. Un accident mortel a jeté un voile de tristesse sur la fin de leur campagne. Le lundi 6 avril, M. Gombert, pensionnaire de l'Institut français d'Archéologie, qui dirigenit les fouilles de Tonnah, voulut explorer la colline à laquelle la stèle de Khonniatonou est adossée. L'enquête menée par notre inspecteur de Miniéh, Soldii effendi Arif, prouva qu'il s'était aventuré, seul et sans aide, sur l'un des sentiers qui courent en corniche le long de l'escarpement qui domine la plaine en cet endroit. Sondain, entre 11 heures et midi, ses ouvriers le virent perdre pied et tomber d'une hauteur de 15 on 16 mêtres ; la roche avait cédé sons son poids, et il s'était fracassé les deux jambes sur un seuil pierreux qui émergeait à demi du suble. Le gardien du Service conrut à Mellaoni chercher du secours, mais six heures s'écoulèrent uvant que le blessé pit recevoir la visite du médeciu attaché un Markaz, Mohamed Effendi Anomar. Il fut transporté à Mellaoni après les premiers soins, et là il fut pansé unssi complètement que son état le comportait par le Dr. Askreu, de la Mission Américaine, que les autorités locales avaient mandé surle-champ. Le Directeur de l'Institut, M. Chassinat, prévenu par une dépêche, se rendit sur les lieux avec M. Lacan, et tons deux, avec le concours dévoué du D' Askren, l'emmenèrent au Cuire dans la unit du 7 au 8. Recu à l'hôpital français, il y mourut le dimanche 12 avril, jour de Pâques, à 4 heures et demie de l'après-midi. La perte de sang au moment de la cluite avait été si grande et l'ébraulement nerveux si violent que la sensibilité en uvait été considérablement réduite: à part quelques intervalles de crise aigué pendant lesquels les douleurs furent intolérables, il souffrit médiocrement, et il ne sonpçoma jamais l'état désespéré dans lequel il s'était trouvé des l'instant qu'on le releva. M. Gombert était un élève de l'École Centrale des Arts et Métiers de Paris et un architecte d'avenir, qu'un goût très vif pour l'archéologie avait amené en Egypte. Il avait travaillé aux fouilles françaises d'Abon-Roache, de Baonit et de Tounali. Sa troisième année de séjour finissait et il alluit rentrer en France, lorsque la mort l'a frappé traitrensement. Tous les savants présents en Egypte, Allemands, Anglais, Italieus, ont vonlu s'associer, comme le Service des Antiquités, au denil de l'Institut français, et présenter l'expression de leur commisération au père qui arrivait trop tard pour voir une dernière fois son fils vivant.

L'Institut français avuit ouvert successivement trois chantiers. Celui de Tonnali était en pleine activité lorsque la mort de M. Gombert le désorganisa: le récit de la fouille sera publié par les soins de M. Chassinat, A Baouit, MM. Chassiant et Palanque avaient continué pendant deux mois les travaux imagurés par M. Clédat, l'année précèdente, parmi les ruines d'un mounstère copte. Ils les interrompirent de nouveau pendant les derniers jours de février, et ils s'établirent dans la nécropole de Siont où, à la suite d'un accord intervenu avec un colonel en retraite de l'urmée égyptienne, M. Chassinat avuit obtenu l'indication de plusieurs sites vierges. Ils y étudièrent plusieurs tombeaux intacts des X° et XI dynasties, dont M. Palanque a dressé minutiensement l'inventaire. Le Service a gagné pour sa part deux statues en bois d'un style fruste, mais de belle conservation, et toute une série de cerenteils et d'objets funéraires qui complétent ses séries. Il a en la désagréable surprise de se trouver impliqué, ainsi que M. Chassinat, dans un procès que plusienrs des commanditaires du colonel avaient intenté à celui-ci an moment du partage; mais ce n'était la qu'une chicane, et il a été mis promptement hors de cause par le tribunal mixte du Caire.

L'antique Antinoé a fourni à M. Gayet son contingent habituel de cadavres desséchés de basse époque romaine, et d'objets de toilette, de culte on de ménage, parmi lesquels il a era reconnaître un outillage de sorcière. M. Jonguet et son collaborateur Gustave Lefebvre, envoyés par le Ministre de l'Instruction Publique de France et par l'École française d'Athènes, après avoir achevé l'exploration de Médinet en-Nahas et de Médinet Mahdi au Fayonm, ont poussé une pointe sur la grotte des Crocodiles à Maabdéh, puis, d'après mon conseil, ils se sont arrêtés à Tehnéh, on personne n'avait travaillé sérieusement. Ils n'ont pas abordé la butte où se cachent les restes superposés de la ville ancienne: ils ont opéré dans les nécropoles gréco-romaines, et ils en ont retiré des monuments fort originaux, entre antres des cercueils et des monies en miniature à masque d'épervier et à décor en cire colorée. Plus de cent cinquante stèles funéraires en grec et en copte ont été retennes par le Service, et sont allées enrichir le Musée d'Alexandrie.

Les missionnaires allemands out poursnivi leurs explorations sur leurs sites accontinués. M. Borchardt a persévéré autour des pyramides d'Abonsir, et M. Rubensohn, après avoir hésité quelque temps, s'est fixé sur les tells d'Achmonnéin, non sans succès, partie aux frais de la Société Orientale, partie pour le compte de diverses Universités. Entre temps, le gonvernement allemand a sollicité par voie diplomatique le prêt, vers Médinet-Habou, d'un terrain on bâtir une maison à l'usage des savants qui désireraient étudier les hypogées thébains: c'est une conception pareille à celle que le gouvernement français avait ene des 1883, lorsqu'il construisit sa maison à Lonxor, entre le temple et l'hôtel Pagnon. Le terrain a été délimité en janvier 1903, d'accord commun entre M. Borchardt, M. Carter et moi, puis il a été remis aux représentants de l'Allemagne, sous condition pour cenx-ci de l'employer tonjours dans un but purement scientifique, et de n'y installer ni hôtel, ni établissement commercial on industriel; il ne pourra être ni loné, ni transféré, ni aliéné d'ancune manière, et, le jour où l'Allemagne renoncemit à l'occuper, il reviendrait de droit un gouvernement égyptien avec les constructions, les plantations et tons les aménagements qui y auraient été faits.

Vers le même temps, la difficulté de défendre les cimetières de Guizéh contre les entreprises des bédouins a décidé le Comité d'archéologie à en concéder l'exploitation aux particuliers qui se présenteraient. M. Covington avait travaillé déjà en 1902 au Sud du Sphinx, et il avait mis au jour un mastaba d'époque archaïque. Cette découverte, dont les personnes pennu comant des travaux de Muriette, s'étaient exagéré l'importance, avait soulevé une éniotion assez vive, qui se traduisit, en janvier 1902, par des protestations contre l'attribution du site à d'autres qu'à des professionnels de l'égyptologie: d'accord avec le Contentieux du Ministère des Travaux Publics, j'ai maintenn les droits de M. Covington jusqu'au jour où, l'argent lui manquant, il y renouça de lui-même. Je pris alors la suite des travaux, et je déléguai M. Quibell à les achever. Ils ne dou-

nèrent, comme nous avions lieu de le penser d'après l'expérience de Muriette en 1859, 1860 et 1861, que des résultats à pen près mils: depuis lors, la concession de M. Covington est demenrée virtuellement vacante. Le reste du terrain qui avoisine les pyramides a été divisé en trois lots entre MM. Steindorff, Reissner et Schiaparelli, avec cette réserve tontefois que, vu l'importance des lieux, si d'antres requérants se présentaient, une part leur serait attribuée dans les endroits où les premiers occupants n'auraient pas encore établi leurs chantiers. M. Reissner s'est borné à prendre possession de son domaine qu'il compte explorer à fond et de manière exclusivement scientifique; MM. Steindorff et Schiaparelli ont procédé à l'exploitation du leur, et ils y ont déblayé quelques mastabas assez bien conservés de la IV® dynastie.

M. Steindorff agissait pour le bénéfice de l'Université de Leipzig, mais M. Schiaparelli avait une mission officielle du gouvernement italien. L'Italie s'est décidée en effet à snivre l'exemple que lui donnaient l'Allemagne, l'Angleterre et la France, et elle s'est associée à l'exploration archéologique de l'Égypte. M. Schiaparelli a demandé et obtenu, ontre le champ de Guizéh, quatre localités importantes: la Vallée des Reines à Thèbes, le Gebel-Tarif dans toute sa longueur, les ruines d'Achmonnéin, et l'emplacement de l'antique Héliopolis. Il n'a pas touché cette année an Gebel-Turif et il a efflenré à peine Héliopolis. Il a déconvert et vidé complètement, avec l'assistance de M. Ballerini, plusieurs tombeaux dans la Vallée des Reines; le plus intéressant à tous les points de vue est celui d'un certain prince Khamoisit, fils de Ramsès III. M. Breccia a travaillé quelques semaines à Achmonnéin, et il y a recneilli des fragments de papyrus assez nombreux; toutefois des difficultés, survenues entre lui et M. Rubensohn an sujet de leurs concessions respectives, ne lui out pas permis de donner à ses opérations toute l'étendue qu'elles comportraient.

M. Reissner n'n pas encore ouvert d'ateliers à Gébéléin; de même que les années précédentes, il a concentré ses efforts sur les cimetières archaïques de Thinis, à Naga ed-Déir. Il y a appliqué, en collaboration uvec M. Lythgoe, la même rigneur de méthode dont il avait donné l'exemple dans ses campagnes autérieures, et il en a été récompensé par le même succès.

M. Garstang s'est risqué sur les pentes inférieures de Béni-Hassan, que j'avais jusqu'adors recommandées en vain à l'attention des égyptologues, et il y acouvert, outre deux hypogées de l'âge Memphite, beaucoup de tombeaux encore intacts du premier Étapire Thébain, ceux des princes secondaires du nome de la Gazelle ou des officiers attachés à la personne des grands seigneurs enterrés à l'étage supérieur; sa campagne a été

presque aussi fructueuse, pour lui et pour notre musée, que celle de M. Chassinat, à Siont.

M. Flinders Petrie, qui agit cette fois encore pour le compte de l'Egypt Exploration Fund et de l'Egypt Research Account, a dégagé les restes du sanctuaire d'Osiris, à Abydos, et il est descendu dans le sous-sol jusqu'aux ruines des édifires de l'époque thinite; il a de plus retrouvé, derrière le temple de Séti 1<sup>et</sup>, le Memnonium sonterrain de Ménephtala, dont les sculptures promettent une riche moisson de représentations et de textes curieux. M. N. de G. Davies a continué de copier quelques-uns des tombeaux d'El-Amarna dans l'intérêt de l'Archaeological Survey. MM. Newberry et Tytus ont relevé une partie nouvelle du palais d'Aménôthés III, au sud-ouest de Médinet-Habon. M. Mond a vidé et nettoyé entièrement ciuq des tombes de Cheikh Abd-el-Gournala. Enfin MM. Greufell et Hunt ont recueilli à Bahnésa, dans les décombres de l'antique Oxyrrhynelms, une riche collection de papyrus, dont-plusiènrs leur ont rendu des fragments inédits d'auteurs classiques.

En exécution de la décision prise en 1902 par le Comité d'archéologie, aucune concession nouvelle n'a été accordée aux amateurs qui avaient demandé l'autorisation de fouiller. Le Service, lui non plus, n'a pas entrepris de fouilles proprement dites, mais, en exécutant le déblaiement de la pyramide d'Ounas, à Sakkarah, M. Barsanti a rencontré un grand puits d'époque saîte, celui d'un amiral Hikoumsaouf, dont la momie a enrichi le Musée de beaux bijoux en or et en pierres dures. M. Carter a, comme je l'ai dit plus hant, ouvert l'hypogée de Thoutmôsis IV, puis il a attaqué l'hypogée de la reine Hatshepsouitou, le tont aux frais de M. Théodore Davis, M. Baraize a relevé et mis au net trois nutres feuilles du plan de la nécropole thébaine.

Mais, si nous avons dû restreindre encore nos fouilles personnelles, nous avons imprimé un développement considérable à nos travaux de réfection et de consolidation des monuments existants. J'avuis chargé, l'an dernier, M. Barsanti de préparer les édifices de Philæ à recevoir le choc de l'ean: l'éprenve de cet hiver justifie la confiance que j'avais mise en lui, comme aussi elle a tourné à l'honneur de MM. Ball et Taylor, à qui le Ministère des Travaux publics avait confié le soin de ruffermir le sous-sol de l'île et les fondations des monuments. Les dégâts subis par les reprises et les sontènements récents out été absolument insignifiants, et les quelques retouches que nous avons été amenés à y faire n'ont pas atteint la somme de 10 L.E. D'autre part, les monuments sont sortis sains et saufs du bain prolongé qu'ils avaient subi. Il est vrai que le mur du temple de Rome et d'Auguste s'est écroulé, mais sa chûte ne pouvait être évitée: tous les autres temples sont intacts. Nous avons donc

tonte raison d'être satisfaits et d'espérer pour le mieux; néammoins, il sera prudent d'attendre cinq on six années encore, avant de porter un jugement sur le sort qui attend Phike. Les sels ont foisonné en effet aux points de rencontre de l'air et de l'eau sur la surface de la pierre, et la bande humide qui cerne la base de tontes les murailles m'inspire des craintes. Des lavages minutienx nons ont débarrassés des efflorescences, mais nons sommes désarmés contre l'humidité permanente et contre les actions diverses qu'elle pourra produire à l'intérieur des blocs de grès.

J'avais signalé l'an dernier l'état précaire dans lequel se trouvait une portion du mur occidental du temple d'Horus à Edfon, et l'urgence qu'il y avait de le reconstruire. M. Barsanti s'est rendu sur les lieux à la fin de mars 1903, en compagnie de M. Carlo Oropesa et du réis Khalil, et il a procédé, sur une longueur de 85 mètres, à la démolition du mur memicé. A mesure que les blocs descendaient, il les emmagasimait régulièrement à l'onest du temple. La dépose achevée, il a consolidé les fondations en les garnissant sur leurs deux faces d'un banc de béton qui en a triplé la largeur. Il n'a quitté les lieux que dans les premiers jours de juillet, malgré la chaleur torride qui n'avait presque pas cessé de sivir depuis le début des opérations, et il a réonvert ses chantiers dans la première quinzaine de novembre. A la fin de décembre 1903, dix assises étaient remontées déjà à leur place primitive. M. Barsanti a ordre de s'arrêter lorsqu'il aura atteint la quatorzième on la quinzième assise, et de laisser les portions reconstruites tasser jusqu'à la fin de l'inaudation prochaine: l'œuvre sera terminée en décembre 1904 on en janvier 1905 au plus tard. Les dépenses, imputées sur noure fond des touristes, et, par autorisation spéciale de la Caisse de la Dette, sur le fonds de Philae, aut été:

De mars à fin juin	Restaurations	173 12 813	475   sur fonds 761   de 743   Philae.
En jain et juillet	Restaurations   Achal et transport de matériel		17(c) surfonds 625 des touristes
De nov, à fin déc	Restaurations		395 sur fonds do Philo

soit en tout L.E. 1596,809 dont L.E. 1276,016 sur le fonds de Philæ et et L.E. 320,795 prises sur notre fonds des touristes.

A Karnak, M. Legrain a rebâti, jusqu'à la hanteur de six mètres environ, dix des onze colonnes renversées en 1899. Ha, de plus, tout préparé pour le démontage de deux untres colonnes, dont j'avais constaté le manyais état au mois de janvier, pendant mon inspection: il a dressé autour d'elles les pylônes de terre usuels, et il a profité de l'occasion pour déblayer les portions du mur septentrional de la salle qui fuisaient face à la ville antique. Il a de même poussé activement l'uniénagement de la cour située au sud-est de la Salle Hypostyle. Il y a recucilli la plupart des blocs qui manquaient encore à la porte d'Aménothès 1er dont j'avais signalé l'existence parmi les remblais, dans mon rapport de l'an dernier: nons la reconstruirons peut-être en 1904, et nons enrichirons Karnak d'un monument dont le sonvenir était perdu depuis trentequatre siècles. Au cours de ces opérations, et pendant la dernière quinzaine de décembre, M. Legrain a en la bonne fortune de mettre la main sur une véritable mine d'objets antiques. Il semble que, vers l'époque persane ou du temps des Ptolémées, une sorte de gouffre boueux s'était creusé, à peu près dans le milien de la cour; on en fit une javissapour les monuments hors d'usage qui encombraient le temple, et on le combla avec tout ce qu'on avait de monuments et de débris dans le voisinage. M. Legrain a retiré déjà de cette poche onze statues variant d'âge entre la XII° et la XXX° dynasties, la plupart intactes, quelquesunes fort belles qui, toutes, sont allées enrichir le Musée du Caire: elle nous réserve à coup sûr d'autres surprises.

M. Legrain avait reçu en outre la mission de nettoyer la région qui s'étend entre le sanctuaire de granit et la Salle Hypostyle, un nord de l'allée centrale. Il a déplaré l'énorme fragment d'obélisque en granit qui écrasait le nur de Thoutmôsis 1<sup>et</sup>, dégagé l'allée centrale, relevé, dans la mesure du possible, les parties détruites des pylônes et les colosses Osiriens de Thoutmôsis 1<sup>et</sup>. Il a découvert à cette occasion la salle du couronnement de Thoutmôsis III, des bas-reliefs représentant le retour triomphal d'Aménôthès II après sa campagne victorieuse en Syrie, un bean groupe bien conservé de Thoutmôsis IV et de la reine Tiâ. Ç'a été, en somme, la campagne la plus fructueuse qu'on ait faite à Karnak, depuis les grandes campagnes de Mariette, et la dépense totale en a été seulement, du 1<sup>et</sup> janvier au 31 décembre:

13						L.E.	M.
Remontage des colonnes			 0.00		 	721	985
TACHIMICIDE HIS	200	0.00	 			13015	21771
I CESUMBEL.						13134	4 24 1 77
Achat et transport de matériel	* * *	* 0 0	 	***	 	351	748
						2000	000

Il convient d'ajonter, pour compléter ce tableau, l'indication de quelques travaux exécutés au moment du sébakh, dans plusieurs localités de la Haute et de la Basse-Égypte. De même, des portes out été mises à divers tombeaux qu'il importait de protèger contre les déprédations des fellahs, nons avous acheté quelques objets en province, et nons avons accordé des gratifications modestes à plusieurs personnes qui nous avaient signalé des monuments intéressants. Tout compris, l'ensemble de nos dépenses, abstraction faite des sommes consacrées à Edfon et à Karnak sur allocation spéciale, a été, pendant l'année 1903, sur les deux chapitres Fouilles et Compte Touristes, ce qui suit:

1	•			•		L.E. 1	M.
Sakharah						124 11	12
Mit-Rahinéh						17 6	90
Gnizéh						8 6	(18,
Kiman-Faris						11 0	4(1
Zaoniet-cl-Amo						7	
Achmomosin						12 3	65
		• • • •					OCL
Tourish							4(1
Balansourah							120
Bilsm-el-Moulo					• • • • •	Th %	(20)
Assonan		• • • • •				0.10 -	Oth
Konbbet-el-Ha	other					110 5	112
Transport de m	nteriel et e	Lambiqui	tes et rep	arations			
Gratifications p	our objets	signalis					
Achat						. 408 :	330
			297 7 1	* >		1111	7.01
			Total L	.E		1141	721

La plupart des objets que nous avons achetés provenaient de fouilles illicites, et ils avaient été suisis par nos inspecteurs après dénouciation. Bien que nous enssions pour presque tous la preuve suffisante du détournement, j'ui préféré donner quelque argent aux compables, afin d'éviter des procès que, dans l'état actuel de la législation, nous aurions perdus très probablement, malgré notre droit. Un seul surrophage en pierre d'époque Ramesside, volé à Tounah, et dont la cuve avait été mise en pièces par les inventeurs, nous a coûté de la sorte environ L.E. 230. Il est regrettable que l'État suit forcé de dépenser de pareilles sommes pour récupérer son bien légitime.

## III. - LE MUSÉE ET LES PUBLICATIONS DE SERVICE

Dans mon rapport de 1902, j'avais exprimé la crainte que nous n'enssions dépassé de quelques rentaines de livres la somme de L.E. 8500 qui nous avait été allonée pour notre déménagement. Les comptes n'étaient pas apurés complétement, un moment où j'écrivais, et nous ignorious enrore l'étendue de nos engagements vis-à-vis de l'Adminis-

tration des Chemins de fer de l'État. J'ai en, depuis lors, la satisfaction de constater que les chiffres prévus par moi n'avaient pas été atteints, et que notre dette était moindre que je ne l'avais supposé. Nos opérations, loin de nous laisser en déficit de quelques centaines de livres, se soldent par un bénéfice d'environ L.E. 80. C'est un fait que je suis heureux d'enregistrer.

A mesure que nous connaissons mienx notre logis neuf, les défants qu'il présente devienment évidents et nous essayons de les corriger. L'un des plus saillants et sur lequel j'ai attiré, des le début, l'attention des architectes, était la surabondance de lumière et l'excès de chaleur qui en résultait. Dès le lendemain de l'installation, j'avais fermé toutes les ouvertures pratiquées dans la muraille extérieure du premier étage et les claustra qui bordent la partie hante de la galerie centrale; des châssis en bois léger, garnis de gros papier bitumé et revêtus sur leurs deux faces d'un fort calicot sur lequel on passa par la suite une conche de badigeon blanc, nous permirent d'arriver à nos fins pour un peu moins de L.E. 20. Les galeries latérales du premier étage y gagnérent, mais le mieux ne se fit pas sentir dans les atriums à deux étages; le jour continua d'y tomber en larges nappes de clarté brutale et crue, blessant les yeux des visiteurs ou des employés du Service, et dénaturant l'aspect des monuments. Pendant le printemps et l'été de 1902, la température se maiutir t si élevée que certaines de nos peintures grecques à la cire fondirent à moitié; la confenr de plusieurs cercueils s'écailla, les montures en fer de plusieurs des vitrines qui abritaient les momies royales se fanssèrent, et les glaces qu'elles encadraient se félèrent par la dilutation du métal. Des rideaux de toiles de Vichy teinte en bleue furent placés aux fenêtres du rez-de-chaussée, et, tamisant le jour, ils y rendirent la chaleur supportable; mais il fullait user de moyeus plus radicaux pour le premier étage, et le Ministère voulut bien, sur mes instances réitérées, remplacer les vitrages en toit à double peute qui reconvraient nos atriums par les lauternaux cubiques, à fond plein, à éclairage latéral, semblables à ceux de l'ancien musée de Boulak. Cette modification, commencée en mai par la Direction des Bâtiments civils, a été nehevée dans les premiers jours de décembre, et les conséquences en sont tont à l'avantage de nos collections; la lumière pénètre en quantité suffisante dans les salles du rez-de-chanssée et n'est plus dangereuse dans celles du premier étage. Nous devrons toutefois compléter l'effet de cette transformation par un système de rideaux ou de volets dont nous ferous l'essai pendant l'été de 1904.

Le Musée nous avait été livré presque un. Au rez-de-chaussée, une bande de peinture rouge, à l'huile, couvrait les soubassements jusqu'au tiers de la hauteur, mais, partont ailleurs, les mues avaient été simplement passés au blanc. Après avoir étudié la question près d'une nunée, je me décidai ir tenter, sous um propre responsabilité, un essai de décoration du rez-de-chaussée. Le style général de l'édifice et le soubassement ronge qu'on hu avait donné nons imposaient le parti pompéien: il me parut qu'il fallait relever la bande préexistante aux deux tiers de la hanteur, de manière à former un fond sur lequel les statues s'enlèveraient mut entières en vigueur. Je choisis, pour le tiers supérieur, un ton rrème à la détrempe, et pour les chapiteaux des piliers un modèle à fond rouge qui rappellerait les soubassements et qui ferait la transition entre la tonalité violente du bas et les tonalités donces des plafonds. J'attribuai à cenx-ci une nuauce d'un blen très lèger, qui atténuât encore la lumière et dont le reflet enveloppât les monuments d'une atmosphère plus calme et plus fine que celle dans laquelle ils se trouvaient présentement. L'ensemble, exécuté dans la Salle M sur mes indications par le peintre du Service, M. Carlo Oropesa, en noût et septembre, retouché puis simplifié par moi au début de novembre, plût au Comité d'archéologie et à la Direction des Bâtiments civils : je demandai un Ministère de vouloir bien s'en remettre à nous du soin de décorer le rez-de-chaussée. On pensa, comme moi, que nos peintres, dressés au respect de l'antiquité et surveillés directement par M. Oropesa, risqueraient moins de tacher les monuments que les ouvriers des entrepreneurs ordinaires; nons étions d'ailleurs assez hien outillés pour accomplir notre tache de façon très économique. Le Ministère voulut bien mettre à una disposition une somme de L.E. 512 qui suffira largement. M. Oropesa s'est attelé à la besogne en décembre 1903 et il anna tout arhevé en mars 1904; nous nous occuperons ensuite de chercher des motifs et des tous qui convirunent aux salles du premier étage.

D'autres améliorations sont à l'étude et pourront être opèrées en 1904. Grâce à l'intervention amicale de Sir Eldon Gorst, le Ministère des Finances nous avait cédé, outre les marbres du grand escalier de Guizéli, tous les marbres, toutes les vitreries et toutes les ferrures de ce palais que je jugerais utiles à l'installation du Musée nouveau. J'ui par recueillir ainsi un nombre de balastres, de mains-conrantes et de plaques assez considérable pour qu'il soit possible de substituer un dallage en marbre aux rimeuts de la galerie d'honneur, et de remplacer les balastrades et et les rampes en maçonnerie pleine qui déparent le premier étage de cette même galerie, et les escaliers par des balastrades et des rampes de marbre à jour. Ces changements s'opéreront par les soins de la Direction des Bâtiments civils, un printemps de 1904, après le départ des touristes; sur une demande, one profitere de la circonstance pour supprimer les

maleucontreuses ouvertures ovales qui échairent l'antichambre des deux escaliers principanx et pour mettre à leur place un plafond en verre.

L'exèdre bâti autour du sarcophage de Mariette a été achevé en novembre 1903, et la statue en bronze qui doit l'orner a été expédiée de Paris par le sculpteur Pucch, dans la dernière quinzaine de décembre: elle sera mise en place par M. Barsauti, et nous espérons que l'inauguration pourra en avoir lieu en mars 1904.

Les bâtiments du secrétariat nons ont été livrés au mois de septembre et les bureaux y out été installés aussitôt par les soins de M. Bazil. Les pièces qu'ils avaient occupées à l'intérieur du Musée ont été uniémgées aussitôt, l'une en cabinet pour le Directeur Général, qui n'avait point sa place dans le Musée et qui avait reçu un asile provisoire à la Bibliothèque, l'antre en salle de réunion pour le Comité d'archéologie qui siégeait maguère au Ministère des Travaux publics. Les aménagements nécessaires ont été faits avec les huisseries et les verreries que le Ministère des Finances nons avait autorisés à prendre au palais de Guizelt.

Le classement des collections a progressé sans relâche. Au rez-dechanssée, nons avons réussi à trouver un emplacement définitif en bonne lumière, pour la plupart des monuments sur lesquels il convenait d'attirer l'attention du public, et, comme conséquence de cet arrangement modifié, nons avons rectifié la numérotation de l'ensemble. Nons avons substitué aux numéros noirs, sans suite, qui étaient propres au Musée de Guizéh, des numéros rouges qui se continuent de salle en salle; j'ui laissé dans la série des lacunes qui permettront d'y insérer les monuments nouveaux à leur rang, sans qu'il soit besoin de la bouleverser tous les deux on trois ans. A mesure que l'œuvre avançait, j'ai remanié les parties du Guide imprimé l'au dernier, qui correspondaient aux salles du bas, et j'en ai corrigé les errems on complété les notices: M. Quibell a traduit le texte ainsi revu en anglais, avec la collaboration de Mª Quibell et de Miss Pirie, et cette traduction a été mise en vente dans les derniers jours de décembre. Une traduction arabe, due à la plume d'Alimed bey Kamal, est sons presse et paraîtra dans le courant de l'immée 1904. Tant que l'édition française de 1902 ne sera pas épnisée, les monnuents du rezde-chaussée qui y sont décrits garderont l'ancienne munérotation noire à côté de la munérotation rouge: les vieux numéros ne seront enlevés que le jour où nous serons en mesure de réimprimer le texte français. En attendant, et pour faciliter la recherche aux visiteurs, j'ai affiché dans chaque salle un plan, sur lequel les monuments décrits figurent seuls et sont indiqués par une teinte rose. J'ni de plus, posé sur chacun de ces monuments une grande étiquette à la main, où l'on lit, un-dessons du numéro ronge, une notice sommaire en anglais, en arabe et en français. Par malheur, les poissons d'argent en ont rongé déjà une partie: j'étudie les moyens de remplacer les étiquettes écrites à l'encre de Chine par des étiquettes inquimées dont l'encre grasse résistera mieux aux insectes destrucieurs Le temps m'a manqué de remanier les salles du premier étage. Nous y avons pourtant fini de garnir le pourtour de la galerie d'honneur avec des armoires vitrées et des mordies appartenant à la série des grands-prêtres d'Amon. Nons avons installé les objets provenant du tombem de Thontmôsis IV dans la salle qui renfermait déjà les objets découverts chez Thoumaôsis III et chez Aménôthès II. Nous avons vidé presque entièrement la salle d'authropologie, dont le contenu est passé dans les collections de l'École de Médecine, et nous n'en avons retenu que les pièces nécessaires à l'histoire de l'embaumement. En revanche, nous avons organisé une salle nouvelle pour la Fanne et pour la Flore momifiée de l'antique Égypte. M. Lortet, doven de la Faculté de Médecine de l'Université de Lyon, nous avait prié, en 1899, d'instituer des fouilles aux frais de son Université en vue de rassembler des nomies d'animaux: pourvu que nons lui permissions de conserver les doubles, il s'engageait à nous renvoyer un Caire la série complète des squelettes et des cadavres montés et préparés, et à les installer dans nos vitrines par les soins d'un des naturalistes de son Musénur, sans qu'il nous en contât rien. Le Comité d'Archéologie avait accepté la proposition, et l'arrangement était entré en vigueur au profit de tous les intéressés, mais j'avais toujours remis l'inauguration de la collection au moment où le musée serait établi dans les bâtiments nouveaux. Au mois de décembre dernier, M. Gaillard, aide-naturaliste au Muséum de Lyon, est arrivé avec ses cuisses et il a procèdé, avec le concours de M. Daressy, à l'accomplissement des promesses de M. Lortet, Il m'a para utile d'exposer partout, à côté des squelettes ou des cadavres déshabillés, les momies des animanx de chaque espèce recueillies dans les hypogées; j'y ai même adjoint les bois que nous possédons et l'herbier que M. le professeur Schweinfurth a bien voulu préparer pour nous depuis 1882, avec les fleurs trouvées sur les momies royales à Déir el-Bahari. C'est, on le voit, un musée unique au monde que nous avons constitué, sons antres frais pour le Service que la confection de quelques vitrines. Nous l'avons étubli vis-à-vis de la sulle des bijoux, dans la galerie qui surmonte la portion sud-onest de la façade principale. L'an prochain, quand nous nurous transporté les bijonx dans le local que je leur ai destiné à l'antre extrémité des galeries, je mettrai à leur place nos admirables collections de silex taillés.

Nos publications se sont développées de la façon la plus encourageante. Les *Annales du Service* ont terminé leur quatrième volume, et je me suis

efforcé d'y umltiplier les planches. J'ai déjà dit que l'édition anglaise du Guide avait para et que l'édition arabe s'imprimait. Notre grand Catalogne s'est enrichi de sept volumes, celui de Daressy sur les Textes et Dessins magiques, celui d'Edgar sur les Greek Moulds, celui de Grenfell et Hunt sur les Greek Papyri in the Cuiro Museum, celui de Bissing sur Die Fayenzengejässe, celui de Strzygowski sur Die Koptische Kunst; enfin le quatrieme volume de Lange-Schiffer sur les Grab-and Denksteine des Mittleren Reichs n vn le jour ainsi que le premier de M. Lacan sur les Sarcophages antérieurs au Nouvel Empire. Neuf autres volumes sont sons presse, ceux de Chassinat sur la Seconde tronvaille de Déir el-Balairi, de Milne sur les Stèles Grecques et Romaines, de Spiegelberg sur une partie de nos Textes Démotiques, de Carter et Newberry sur le Tombeau de Thoutmôsis IV, d'Edgar sur les Greek Bronzes, d'Aluned bey Kunnal sur les Stéles hiéroglyphiques d'époque ptolèmaique et ramaine, de Quibell sur les Archuic Objects, plus la troisième partie du catalogue de Lange-Schäfer et la seconde de celui de Lacau; la plapart d'entre enx paraîtront dans le conrant de 1904. Nous avons cufin en préparation huit volumes, de Lacau sur les Stèles du nouvel empire, de Daressy sur les Statues et statuettes de divinités, de Maspero sur les Sarcophages en pierre des époques saite et grecque, il'Ahmed bey Kamel sur les Tables d'offrande, de Newberry sur les Scarabées et sur les Statuettes Funéraires, de Weigall sur les Paids, de Bissing sur les Vases en pierre, d'Edgar sur les Green-Egyptian Glass. l'ajouterni que, profitant de la présence de M. Guillard, je l'ai chargé de rédiger le Catalogue de la salle des animanx, et, qu'usant de la faculté que le Camité m'a accordée d'engager pour quelques mois les savants de passage en Égypte, je me suis assuré le concours de MM. Dyroff, Moret et Bénédite pendant l'hiver de 1903-1904. Les frais de rédaction et d'impression sont, cette fois encore, converts par les L.E. 2,000 que la Cuisse de la Detre veut bien m'attribuer à cet effet chaque année, et par les économies que j'ai pu réaliser sur les fonds qu'elle m'uvait accordés pour le même emploi peudant les années précédentes.

Je suis heureux d'annoncer que le second volume du Dahrhour de M. de Morgan est enfin terminé, et que le second fascicule du tome deuxième de son Kom-Ombo est à l'impression, ainsi que le premier fascicule du tome deuxième du Musée Égyptien. Dès que l'achèvement de ces ouvrages aura rendu disponibles les fands sur lesquels ils étaient imputés, je reprendrai la publication du Cutalogne général des monuments de l'Égypte avec le Karnak de Legrain et le Médiaet-Habon de Daressy.

Notre bibliothèque a continué de s'enrichir : elle a acheté on reçu en don, cette année, un millier de volumes et de brochures nouvelles. J'ni

dù m'adjoindre les services d'un employé spécial, M. Ducrot, pour la mettre en ordre, la classer et en rédiger le catalogue. Les opérations préliminaires de cette entreprise out pris fin en décembre. La confection des fiches commence, et j'espère que nons ne reverrons plus reparaître le désordre qui nous a fait perdre naguère quelques-mis de nos volumes les plus précieux.

Exposition Universelle de Saint-Louis. — Cette année, le gouvernement égyptien, renouant une tradition interrompue depuis un quart de siècle, décida de participer à l'Exposition Universelle qui s'ouvrira à Saint-Louis d'Amérique, en avril 1904, et le Service des Antiquités fut prié de collaborer à l'organisation de la section égyptienne. L'invitation me fut transmise un mois de mai 1903 ; en même temps avis me fut notifié que le Ministère des Finances plaçait L.E. 2,500 à ma disposition, et qu'en plus, une indemnité journalière de L.E. 2 serait allouée au délégué que nous enverrions installer et surveiller nos collections. Il m'a fallu improviser cette exposition en six mois : on me pardonnera, je l'espère, si elle n'est pas aussi complète que je l'aurais faite, prévenu plus tôt. Je me suis décidé à y introduire deux éléments différents : des reconstitutions exactes des scènes de la vie antique; des séries de pièces originales, choisies de manière à donner une idée suffisante des monnments qui nons font connaître la civilisation égyptienne.

Ce plan sommaire approuvé par le Ministère des Travaux publics, je commandais à M. Hébert, sculpteur attaché au Musée d'Ethnographie de Paris, et à qui j'ai en à faire plusieurs fois pour des restitutions de ce genre, notamment lors de l'exposition de 1889, dix mannequins en plâtre, de grandeur naturelle, représentant dix Égyptiens de l'époque Ramesside, six femmes et quatre hommes, dans des attitudes diverses.

Ils devaient être groupés de manière à former trois scènes :

1º Une danse égyptienne à sa toilette; elle neliève de se farder les yeux, et une servante agenouillée lui présente un vêtement.

2º Un fonctionnaire de haute classe, dinant. Il est assis devant un guéridon chargé de mets; un serviteur l'évente et tieut la goulléh pleine d'ean, tandis qu'une musicienne et une dansense exécutent sons ses yeux un intermède de danse et de chant.

3º La fabrication du pain et de la bière. Ces deux opérations ont été rémuies, la première étant indispensable à l'autre, et la bière se fabriquant avec une levure de mie de pain. Le tout occupe quatre personnages: deux femmes, dont l'une écrase le grain et dont l'autre enit les miches ; deux hommes, dont l'un brasse la pâte et dont l'autre poisse les jarres qui doivent contenir la bière, afin d'empêcher qu'elle ne se gâte en vieillissant.

Le corps de ces dix mannequins fut moulé sur le vif, dans les poses que j'avais choisies. Les têtes furent modelées d'après des têtes de statues égyptiennes, celle de la soi-disant Taia, celles de la mère de Thoutmôsis IV et de Thoutmôsis IV lui-même, celle du scribe Joupai, du Louvre, L'cusemble fut peint par M. Hébert et par ses aides, et les perruques furent agencées, sur des modèles que j'avais indiqués, par le perruquier du Théâtre Français.

Ces opérations remplirent une dizaine de semaines, de juillet à fin septembre, mais les caisses n'arrivèrent au Caire que dans les derniers jours de novembre : comme les mannequins avaient souffert pendant la traversée de la Méditerranée ils furent restaurés très adroitement par le sculpteur et par le peintre du Musée, MM. Fanghænel et Oropesa. Cependant, l'un de nos mennisiers, M. Andrea Altobello, avait préparé, d'après des originanx que j'avais trouvés au Musée, tous les accessoires de chaque scène, lit, chaises, pliants, tables, coffres à linge et à bijoux, objets de toilette, instruments de unsique. Brugsch bey avait découvert des étoffes indigènes, de fabrication et de dessin pareils à ceux des étoffes nuciennes : une conturière ajusta les costumes sur les patrons que j'avais taillés. L'habillage terminé, chaque scène fut réglée par moi et photographiée par Brugsch bey, pour que notre représentant pût la remettre en place à Saint-Louis dans l'ordre qui m'avait paru le plus propre à en faire valoir le détail.

Le peu de temps qu'on m'avait accordé ne m'aurait pas permis d'opérer de fouilles spéciales en vue de me procurer tous les objets dont nons avions besoin. J'ai pu tirer de Sakkarah un mastaba complet de la 1 V° dynastie, mais il m'a falla empranter une partie des autres monuments aux réserves du Musée et acheter le reste aux marchands d'antiquités. Néanmoins, je pense que l'ensemble intéressera les visiteurs de l'Exposition. Je me suis efforcé de leur montrer une série l'unéraire nussi riche que possible, et, à cette intention, j'ai expédié, outre le mastaba, un beau sarcophage carré, en granit rose, de la IV dynastie, sans inscription, deux cercueils carrés de la XII<sup>a</sup> dynastic, déconverts à Siont cette année même, trois cerencils authropoïdes avec momies de l'âge Rumesside et de l'époque grecque. Le mobilier comprend quelques chevers en pierre on en bois, quelques barcaux, quelques coffrets à statuettes, un choix de répondants des types les plus variés, des anulettes, des colliers, des perles en émail multicolore on en pierres dures. Un bon choix de statnettes en bronze et en terre énaillée donnera quelque idée de la religion égyptienne, mais la peinture et la sculpture ne seront représentées par aucun objet de valeur, en dehors des las-reliefs de notre mustaba : nons n'avons pu envoyer que des monlages dont le plus important, celui de

nôtre Khéphrèn, a été peint par M. Oropesa et reproduit très exactement

l'aspect de l'original.

Sur le refus de M. Brugsch bey, M. Quibell a bien voulu se charger d'aller installer notre section et de la surveiller pendant les premiers temps au moins. Pour lui faciliter la mise en place, j'ai fait fabriquer au Musée toutes les boiseries des armoires nécessaires : il n'aura plus qu'à en assembler les pièces et à les garnir de verres loués à Saint-Louis même, et, en quelques jours, tous les petits objets de notre envoi pourront être exposés. Le remontage du mastaba sera un pen plus long, mais le numérotage des caisses qui le contiennent est tel, qu'aucune erreur n'est-possible dans l'upparcillage des blocs. M. Quibell a de plus une liste des prix dressée par Brugsch bey avec les indications nécessaires pour les majorer de toute la quantité qu'il estimera utile à couvrir les frais de transport, d'aménagement et de gardiennage. L'emballage sera terminé vers le 25 janvier, et, à partir de cette date, le convoi entier et M. Quibell lui-même seront à la disposition de M. le Commissaire Général.

Les dix mannequins nus ont conté chacun 500 francs; rendus au Caire, habillés, pourvus de leur mobilier et de leurs accessoires, l'ensemble des trois scènes nous est revenu à L.E. 300 environ. Le mastaba, emballé et prêt à partir, représente un pen plus de L.E. 200. Il nous n falla dépenser environ L.E. 700 pour nous procurer le reste de la collection par fouille on par achat. D'autre part, j'avnis prélevé L.E. 1000 pour les frais de voyage et d'installation à Saint-Louis : L.E. 300 ont été remises à M. Quibell, et L.E. 700 à M. Lawford. Afin de me couvrir contre toutes les erreurs de prévision possibles en pareille matière, j'ai mis à part L.E. 300 qui, au cas où nos calculs auraient été justes, pourront être employées, dans la suite, à compléter par de nouveaux envois d'Egypte, celles de nos séries que M. Quibell, étant sur les lienx, jugera convenible de renforcer. L'exposition close, tous les objets sans exception seront vendus, et, pour peu que l'opération soit canduite avec soin, je pense que le produit en sera assez considérable pour rembourser le Trésor Égyptien de ses avances, en partie sinon en totalité.

Je ne puis mieux terminer ce rapport qu'en y joignant l'état comparatif de nos recettes hors budget, pour les deux saisons 1901-1902 et 1902-

1903:

NATURE DES RECETTES.				1901-1	902.	10-02-1	Ja13,	Ho pine 1902-1	
				L.E.	M.	L-H,	М.	L.E.	M.
Touristes				3,796	500	3,951	100	154	1600
Salle de vente	*			926	(310)	1,050	885	121	275
Entrée au Musée				(25	550	714	()(h(1	88	540
Th 8 30 4	Publications			241	670	574	072	331	4(12
Publications	Clasts			378	582	543	841	165	259
	Total	• •	• •	5,969	912	6,833	988	864	1)76

On voit que l'augmentation est sensible sur toute la ligne : elle tient, pour le fonds des touristes et pour les *chakjs*, à l'activité de nos agents et à la surveillance plus efficace qu'ils exercent sur leurs districts. J'estime pourtant que la frande sur les billets enlève encore un cinquième environ de la recette, et que nous touchons à peine la dixième partie de ce que les *chakjs* devraient nous rapporter : j'essaierai de remédier à cet état de choses, mais on sait combien la frande est difficile à déconvrir en pareille matière, et il s'éconlera des années avant qu'elle soit réprimée complètement.

G. MASPERO.

# REPORT ON AGRICULTURAL RAILWAY LINES

1903

BY

JAMES A. GUNN.



### REPORT ON AGRICULTURAL RAILWAY LINES.

Cairo, 26th March, 1904.

SIR WILLIAM GARSTIN, K.C.M.G.,

Under Secretary of State,

Ministry of Public Works.

SIR,

General Remarks.—In reviewing the working of the Light Railways for 1903. I have the honour to state that there has been a very sound improvement in every way. The receipts have increased notwithstanding the fact that the year has been a rather unfavourable one, owing to a shorter cotton crop and other drawbacks, such as cattle plague and the fact that no Moulids were held, all of which considerably affected the traffic. In addition to this, the lines had no minisual augmentation as was the case during the previous year for large irrigation works.

The kilometrage has not been materially increased, but a great deal of work has been done and large sums have been expended in lengthening sidings, reducing gradients, and more fully equipping the lines with engines and vehicles. A more highly paid staff has been found necessary in order to handle the traffic. The Companies do not give a uniform service, nor can it be expected of them, as some districts are so much more remimerative than others, but where the traffic warrants it, they give the public a very good service. Special goods trains are frequently needed to relieve the traffic, and the Companies should be encouraged whenever it is necessary to run these specials to ensure a more regular service.

There have been considerably over four and a half million (4,783,885) passengers carried during the past year, and only few complaints recorded, most of which were due to irregular train service. There is, however, a marked improvement in this direction, and I think all the Companies are beginning to realize that an irregular service is damaging to themselves; it is, however, largely minimized by the number of specials they are running.

Tariffs.—The question of tariffs is now before the Light Railway Commission. The note which I have prepared on this subject has been

laid before the Commission and is appended hereto. The chief points of which are :—

1st. The advisability of only fixing a maximum for all classes as laid down by the Concession.

2nd. After the classification has been accepted by the Government, there is no need to fix a minimum.

3rd. That undue competition should be avoided, adhering to rule B recommended by the Commission in September, 1902.

4th. That the Companies should be allowed to change their rates between the maxima of one class to the maxima of the next class below, without applying to the Government.

The lifting of unremunerative lines .- There have been one or two cases of this nature before the Commission: one in Fayoum and one in Lower Egypt. The former Company was allowed to do away with the line, but in the latter case sanction was witheld. I would suggest that some fixed rules should be adhered to in deciding these matters. In the East Province the lines seem to have been laid without due consideration. The present owners naturally wish to be relieved of the ours of keeping up an unremmerative line; the section in Charkieh through which it runs from Bordein to Bordein junction is certainly well served by the Government lines and the land-owners adjoining the light railway line do not appear to use it at all. In the case of the Fnyoum, very much the same circumstances exist, but they have not yet availed themselves of the permission to lift their line. I would recommend that if a Company can satisfy the Government that the lines are not being, or likely to be used by the land-owners adjoining after a fixed time for trial, say three years, that they should be allowed to lift their lines.

Level crossings.—Although it is generally admitted that level crossings are not desirable, yet it would be almost impossible to insist upon over and under bridges for every crossing; the country is small and closely intersected with agricultural and Decauville lines, the former of which must, of necessity, frequently cross the trunk lines. There are cases where only a few trains are run and these at very low speed, when it would seem that danger is reduced to a minimum, for instance on the line between Cherbine and Kalline where level crossings are applied for, there are only three trains a day with an interval of about six hours between each. The crossings could be made near the stations with a system of signals and interlocking devices, if necessary, and under the control of the Government Railways' Station Master. The opposition

shown by any Government officials to any trains crossing their lines might almost be considered a guarantee of safety in itself. At Beulm where there is a margin of twenty minutes allowed for crossing, if the light railway train is even two minutes late, and they try to make a crossing, the signals are closed against them.

Working jointly with the Government line.—The working of the joint stations has, during the last year, been noticeably better in all Provinces. Goods have generally been promptly transhipped and few complaints have been made for delays by any of the raiways, even during the heaviest season. All the Light Railway Stations have not yet been opened by the Government Railway for through-booking, which is asked for by the Companies. If this is allowed it would no doubt prove a benefit to all.

Location of the line.—This is important from an economical and working point of view. There are many instances of badly placed lines, and the Companies more fully realize the necessity of careful location, as they are taxed to the utmost in maintaining and repairing rolling stock on badly placed lines. The damage to stock and permanent way is heavy and incars great expense. It is, besides, most wearing to the train staff and particularly to the engine drivers to have a line that follows too closely the sharp curves of the agricultural road. With the constantly increasing traffic many changes will be necessary in order to eliminate the curves: in some places new surveys will have to be made.

Figures giving the number of passengers carried, receipts, etc., are appended in Table No. 1.

Increase of goods.—The total number of tons lifted during the year amounted to 642,969, showing an increase of 48,483 tons over the previous year. Considerably less cotton was carried, but there was a large traffic in building materials, there being a substantial increase in this line during the last two years.

Telephones and Telegraphs:—There were 65 kilometres added to the Egyptian Delta Light Railway Company's lines. In general the work has been much better than last year. If properly organized and extended it might be a useful factor in working the interior of the Provinces and no doubt some arrangements could be made with the Companies, as has been done with the Delta.

Lighting of Trains and Stations.—As trains have to do a good deal of work after dark during the winter months, the lighting of trains and stations should be improved. Several cases of cotton stealing might have been prevented had the lighting been better.

New lines.—Twelve kilometres of lines were added in Lower Egypt for the Delta Company.

In future construction of lines.—No curves in the open country should be less than 100 metres.

Under no circumstances should the lines run directly through villages.

Stations sites should not be simuted near public highways.

It would also be satisfactory if some arrangement could be made with the land-owners near stations to avoid crowding and hampering the Companies' works by creeting buildings too near stations. The Government might prohibit the placing of buildings within a reasonable distance of the stations.

Increase of passengers.—The total number of passengers carried by the Companies during the year amounted to 4,783,885, showing an increase on the previous year of 415,001.

The competition with Government lines.—A map is notached showing the Light Railway lines in Lower Egypt and proposed lines. Although it is undoubtedly the case that the Light Railways do compete with the Government lines to some extent, being so closely interlaced with the trunk lines; this is, however, more than made up for by the fact that the Light Railways carry large numbers of passengers and goods to the Government lines. In short they develop travel and traffic, and take it over short lends which would not be profitable to the State Railways.

A significant fact too is that wherever the Light Railways have penetrated, the price of land has gone up enormously not in a speculative sense, but cultivators can go in and find a market practically at their doors by means of these lines.

The boat service must be reckoned with as a very formidable competitor of the Railways, with their long distance transport from the sea South to Assonan and all river ports. The figures received from the Finance Department show that during the last 14 months 1,325 boats of all descriptions have been added to the service, making a total in all

of 22,212 with a total ardebage of 2,534,251, the largest proportion being sailing "Kayassas".

Egyptian Delta Light Railways Company.—The receipts of the Egyptian Delta Light Railways Company to the end of September, 1903, show an increase of L.E. 3,861 over the previous year.

This may be considered very good, as on account of the cattle plague the markets were closed and no Monlids were held, and there was no stone traffic at Zifta Barrage, which in 1902 amounted to L.E.14,426. The cotton crop also affected the receipts.

The Company's working expenses were increased 4% owing to increase of kilometrage and traffic, and a more highly paid staff being engaged.

Receipts and expenditures.—	
	1902 1903
	L.E.
Receipts	125,610 129,471
Receipts	77,193 80,120
Nett receipts	48,417 49,051
Working expenses to gross receipts	61.4696 62.1296
	3.02 3.09
Expenditure ,	1.86 1.92
Passengers carried during 1903	=3,636,688
1902	= 3.311.448
An increase of	325,240
Goods traffic for 1903	471,529 tons traffic
., 1902	the second secon
99 99 100	included)
An increase of	7.601 tons

The Company's corrected measurement is now 813 kilometres. They have constructed in the past year 12 kilometres of line, viz: Samanoud to Kafr Sarem to connect up two sections ... 7 kiloms.

A branch line to Abou Zaabal Quarries ... 3 ,, Nemrch to Banawan, a short branch length ... 2 ,,

Besides these there have been many sidings laid and lengthened in all their Provinces.

They have now under construction, and the bridge work completed on four different sections, amounting to about 44 kilometres of new line.

Surveys have been made in all the Provinces for connecting up their system and opening up the Province of Menoufieh more fully, amounting to about 175 kilometres. Detailed plans, etc., for the line in the latter Province have not yet been submitted for approval.

Equipment.—The Company handle a heavy traffic exceedingly well with a shortage in both engines and wagons. The shortage in vehicles would not be felt so much if they had more power to draw the rolling stock. The present types of engines have proved too light and not suitable for the heavy increase of traffic, but they will do for working on new branches where the traffic will be lighter.

The Company is gradually correcting this shortage in equipment, and 12 heavy 25-ton engines

have been received, also the following vehicles:-

These will very largely help to relieve the congested state of the traffic during the heavy cotton season. With no reserve stock the tax upon the equipment has been very great.

Further orders will probably follow for the work of the new extension.

The maintenance of the Company's lines has generally been good especially in Gharbieh and Behera. In the Provinces of Charkieh and Dakahlieh, owing to the faulty construction of the lines, the work of maintenance has been very heavy and a good riding track cannot be looked for without changes in the alignment, extensive surfacing and possibly new surveys being made. The former owners seem to have consistently neglected the work of surfacing.

The Company's list of accidents during the year has somewhat increased. The majority injured were employees and largely due to their own carelessness. I only notice one fatal accident to a passenger: a boy who fell out of a train and was run over.

Les chemins de fer de la Basse Egypte.—The receipts to the end of June. 1903, show an increase of L.E.1,234 over the previous year.

The passenger traffic is exceedingly good, and to this, the increase is largely due.

There was nothing to noticeably affect the traffic in this section unless it was the closing of the markets on account of the plague. A better service between Mansourah and Matarieh might still further increase the passenger traffic.

receipts and expenditures.—	1902	1903
	L.K.	L.E.
Receipts	21,857	23,001
Receipts Working expenses	11,150	11.381
Neit receipts	10,707	11,711 47. 6%
Working expenses to gross receipts	31. 0%	4.(14
Receipts per kilom, per week	3.85	2. 0
Expanditure	1.96	£. U
Passengers carried during 1903	668,344	
Passengers carried during 1902	011.440	
Increase for 1903	50,901	
Goods traffic during 1902	55,008 to	ns
Goods traffic during 1903	54,642	1
Decrease for 1903	366 to	114

The Company have not added to their kilometrage of 109.

Equipment.—Their equipment is good and will probably answer for some time to come.

The stock is well maintained and the Company have a good reserve in engine and vehicles. The work on their lines has been better. The maintenance of the banks is with difficulty carried out, as the Company have no sidings into the earth koms. A siding had to one of these koms should, I think, amply pay for itself, giving a fertilizer to the country, maintaining their banks, and for filling in stagnant pools that surround stations and villages so dangerous to health. There were four accidents during the year one of which was fatal, the others appear to have been through carelessness and the Company do not hold themselves responsible.

Fayour Light Railway Company.—The receipts of the Company for the year show an increase of L.E. 5,172.345 mill, on the previous year, which is an improvement, but better results would be shown if the lines were more fully connected up. This increase is largely due to a marked development in the Province, the diminishing number of transport camels and donkeys, noticeable after the first year or so wherever light railway lines exist, and the advantages of the system of through-booking with the Egyptian State Railways.

The increase of the working expenses is due to the Company having a more highly paid staff.

Receipts and expenditures .-

	1902	1903
	L.E. M.	L.K. M.
Receipts	12,130 247	18,423 698
morking expenses	11,225 769	13,251 353
Net receipts	904 000	5,173 000
Working expenses to gross receipts	92390	72 %
Annual gross receipts per kilo	84 584	109 665
Animal working expenses per kilo	78 174	78 887
Annual nett receipts per kilo	5 410	30 788
Ratio of goods receipts to coaching	74 %	88.96
Passengers carried during 1903	478,853	140.4 161
1902	439,993	
An increase of	38,860	
Goods traffic during 1903	116,797 tons	
n n n 1902	75,550	
An increase of	41.217 tons	

No extensions have been made during the year, the kilometrage remaining at 168,

The maintenance of the lines has improved during the past year. As in other sections in Lower Egypt the location of some of their branches is not good, having many needless curves. This will no doubt be gradually put right when the system is more fully connected and the lines laid so as to thoroughly work the Province.

Two new engines have been added to the Company's stock. The traffic has been handled better, but the train service might be much improved.

No accidents have been reported to passengers.

I have the honour to be, Sir, Your Obedient Servant,

> JAMES A. GUNN. Light Railway Commission.

## NOTE ON TARIFFS FOR LIGHT RAILWAYS, 1904.

The Articles in the Concession touching on the question of tariffs for merchandise will be found in Appendix A of this note.

It will be noticed that the maxima class rates were those of the Egyptian Government Railway at the time Concession was granted. Under Article 37 the Concessioners were allowed to arrange provisionally a classification for submission to the Ministry for approval.

The Companies apparently submitted turiffs or proposals asking for the adoption of rates similar to the Government, which was approved by the Ministry's letter No. 3875 H.H' of the 18th May, 1898, and while approving of this provisionally it was pointed out that it would be preferable if the Companies would carefully examine and ascertain by experience the condition of their traffic before a final decision was given.

Up to April, 1899, the light railways under this sauction apparently worked on tariffs somewhat similar to the Government Railways.

Letters of the 13th and 15th April, 1899, as per amexes, pointed out that the same tariffs should not be applied to light railways as the conditions of traffic were quite different.

The Government, in replying on the 17th April, 1899, No. 1941 decided to give light milways absolute full powers in regard to their tariffs (see this letter), the object being to give the Companies an opportunity to find a suitable tariff and up to this date they have been working in this way, see letter from the Commission of June 26th 1901.

It is obvious from the Concession that the Government's intention was that the Companies should submit tariffs for approval, and that the maximum of each class should not exceed the Egyptian State Railway at the time.

There does not uppear as if there was mything laid down requiring the same classification of the State line, and this view is confirmed by the subsequent decision of the Government allowing the Companies full powers to change rates for nearly two years in order that they might find a tariff to suit the conditions of their traffic. Thus it will be seen that the Companies have now had a free hand in the matter of rates for some years and have apparently arrived at a tariff that satisfies the public, as there have been few, if any, complaints.

The classification of the various railways as compared with that of the Government Railways will be found with the Ap<sub>1</sub> endix, and it will be noticed the classification for many commodities is different in each line, which is no doubt due to the varying conditions of their traffic.

It would be very difficult to arrange a uniform classification that would suit all railways, and the experience of the Companies tends to

show that it would not suit the public in all eases.

The object of uniformity in classification is, I understand, principally to simplify work of through-booking between railways, but in this country all the Companies are worked on the tariff of the Egyptian Railway Administration for through-booking. If the Government classification is required of the light railways, I feel certain the result will be that the Companies would ask special rates for most, if not all, of their commodities and eventually return to their present tariffs.

I therefore beg to propose that the Commission should:

(1) Recommend a maximum for all classes as laid down by the Concession which distinctly provides for this (see Appendix A).

(2) If necessary, to adjust any articles of their tariffs, and approve

of same not fixing any minima.

- (3) That Rule B as recommended by the Commision in December, 1902, be enforced, which is as follows: That the rate between any two points between which the State Railways and the Companies both have lines should not be less than the rate calculated on the tariff of the State Railways for the shorter distance.
- (4) That the Companies be allowed to change their rates between the maxima of one class to the maxima of the next class below without applying to the Government, viz: for first class between 15 mill.—10 mill. Second class 10 mill.—7 mill. &c. always notifying the Government Railway of any change.

Should the Companies want to lower their rates, for example for 1st class below 10 mill, per 10 kiloms, they must apply to the Ministry 30

days ahead for approval.

Should any undue preference be shown, it would no doubt soon be brought to the notice of the Ministry by the agrieved parties.

This mode of procedure would have the advantage of simplifying

the control of the Companies' tariffs.

In going over the Companies' tariffs, it can at once be seen how very varied their classification is, and how impracticable it would be to require a uniform classification for all. With the maximu fixed, and rule B once enforced, it can make no difference what rates the Companies charge.

# AGRICULTURAL RAILWAYS.

THORITAN.	Average Tetal aum publ for ceaching each licket, reselpts.	i.	74,088 (Ang. 1902 to Sept. 1903.	25.55	9,520 (Jun. 1903 to
1	verngo n pabl for cle tleket.				
1	rin rin	Mill.	20.8	÷.	19-06
			त्रा <u>८,</u> भ	6,048	(New of
S CAKINED.			3,636,688	668,344	100 mm mm mm mm mm mm mm mm mm mm mm mm m
P PARHENDER	Third Chan.		3,444,619	500,116	468,969
NUMBER O	Separati Class.		ı	266.00	1
	First Cluss.		192,049	4,703	2,881
	Average langth of line opened to traffic furing 1903.	Kilometres.	SOS OF SOS	K. 109 or	168 ori
	Trues or Line.		Egyptian Delta Light- Railway Company	Mansourah-Matarieli	3 Fayoum Agricultural Light Railway Company
And the second s	NUMBER OF TARREST CARGINES.	Average Inngth of First Sevend Third Testal, of line opened furing 1903.	Tring of Line, the condition of the cond	Tried of Line for the second Third Total, Pasenger of time of the opened further the opened further the follows.  Kilometree.  Miles.  Kilometree.  Miles.  Kilometree.  Kilom	Tetls of Like   Incorporation   Parish   Paris

# AGRICULTURAL RAILWAYS.

1	Table No. 11.		DEC	THE OF	DETAILS OF PERMANENT	vr Way.			. Immee	Janual Report, 1903.	1903.
Sumber.	Title of Line	Provínce.	Term of tuncession	Fate of concession.	Approxi- unde lougth of lines mentloned in	dange of lines.	Weight of mile.	Length of funs opened Levember 1892.	Length of Hues opened chring 1985.	Fahl bength of lines Becenier 1903,	Linea under cenatrus- lien.
			Yenra.		Kiltems, Miles,	Metrica Ft. lus,	Kitempelan Liber p. 3 d	Kilcons. Milcs.	Kilomu. Miles.	Kilome, Milee,	Kilom. Milter.
grandy	Egyptian Delta Light Railway Company	Behera (Glurbieh / (Glurbieh / Dakahlieh / Kulionbieh	02	March, May, 1896	K. 514 821 M.	W. 175	15 or 32	K. Sel	K. Es	K. SIS or mils. 508	K. 14 or nile. 271
21	Mansonrah-Martarich and Branch	Dukablich	90	June, 1895	К. 1160 М. 62	M. 1.00	23 or 50 Hz.	1021 or 63	N. N. E.	K. 109 or mile, 68	Nome.
2.0	Favoum Agricultural Light Builway Com-	Fayoum	2.0	May.	K. 116	M. e.75	4 5%	212	i z	K. 168	Name.
		Total number of kilometres	of kilone	7	102	1	1	1078	1:3	11341	
		Total number of miles	of miles	0 0	47.4	1	1	67:3	75	189	1

# AGRICULTURAL BAILWAYS.

903.	Ratio of geodin receipts to centifing preselpts.		20.1 63.1	I to 1:99	1 to 189
Annual Report, 1903.	lintin of working expenses to groun receptua.	38	62.12	19.28	71.93
Junua	Aunual net receipte per kilom,	t. K.	66.86	107	30.
	Annual working oxpenses per kilom of three	Entre of the control	99.78	101.	78.
	7.11.24.3 0.3.10.11.11.11.11.11.11.11.11.11.11.11.11.	TE	80,420	1881	
RCKHTh.	Green in Perkins of line included the property of the perkins of t	31	1603	616	601
Goods and Coaching Receipts.	Potestrian inches inche		21.021	60.85	18,423
AND CO.	Readpta fon corclinz,		76,468	15,381	07216
Goods	trentes from goath.	1, 13,	5.2.31	7,707	8,536
	Craffer orrection	Tour.	11.530	\$1°00	116,797
	Average length of Bigeupered to tridic ducing 1203.	Kllem.	K. 806	K. 103	- K. 168
Table No. III.	TITER OF LINE		Egyptian Delta Light Railway Company	Mansoural-Matarioli	Fayoun Agriculturd Light Bailways
	Sumbar.	1	_	रा	4.0



### REPORT

ON THE

# GIZA ZOOLOGICAL GARDEN

For 1903

87

STANLEY S. FLOWER.

DIRECTOR.



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# REPORT ON THE GIZA ZOOLOGICAL GARDEN FOR 1903.

#### I. STAFF.

Director ... ... Captain S. S. Flower, F.Z.S., M.H.O.U., etc.

Clerk ... ... KAMEL FAHMI EFFENDI.
Storckseper ... ... Saleh Lebib Effendi.

Galekeeper ... ... Mustafa el Antabli Effendi.

.. ... Ismail Solimon.

Head Keeper ... ... BAKR AHMED.

Head Carpenter ... Mohammed et. Britairi. Head Gardener ... Ibrahim et. Hamzawi.

One Muliont.

Ten Keepers (1st and 2nd class).

Ten Keepers (3rd and 4th class).

Three Night-watchmen.

One Artizan.

Three Mosaic-pavement repairers.

Two Leading Gardeners.

One Tree-cutter.

Two Propagators.

Seven Flower-men.

Two Mowers.

One Rock-gardener.

Ten Waterers.

Ten Path-sweepers.

Four Garden-Inbourers.

One Carter.

In all, seventy-six men on monthly pay.

And a varying number of labourers on daily pay.

The Director left Egypt on leave on 17th May and returned on 27th August, during this period Captain H. G. Lyons, Director General, Survey Department, P.W.D., kindly acted as Director of the Zoological Gardens.

#### II. VISITORS AND GATE RECEIPTS.

(i) The number of visitors and amount of gate-money as compared with previous years is shown in the following table:—

7.	EAn.		Visitors.	£F.	м.м.
1896	* * *	 	*	481	960
1897	• • •	 	?	766	690
1898	•••	 	2	937	260
1899		 	43,567	991	950
1900	• • •	 	44.296	976	130
1901	• • •	 	50,711	1.114	840
1902		 	47,117	1,037	120
1903		 	55,937	1,213	420

N.B.—One Egyptian Pound (£E. 1) equals £1, 0s. 6 d. or 25 frames and 92 centimes.

## (ii) Visitors, 1903.

	Cham-el	- Seseem	Runfay afternous	Mech days and Emplay Marnings	Soldlers and chlisten	Schmle stc.		Kata-mo	bey
	Paying P 1.10	Paying P. F. G	Paying P.I. a	Paying Pay. 2	Paring P.Y. I	admitted free	TOTAL	££.	m,m.
January			841	4,435	1,374	233	6,883	144	490
February	_	-	1,177	3,008	566	148	4,899	121	670
March	_	-	1.872	5,610	1,398	683	9,563	219	780
April	265	92	758	3,097	636	530	5,378	137	300
May	-	-	426		553	183	3,483	73	250
June	-	_	239	2,004	449	151	2.846	56	520
July	_	-	191	1.954	449	288	2,882	53:	120
August		_	183	- 4	579	139	2,824	53	400
September	_		173	2.012	432	118	2,765	53	210
October	-	-	278	2,388	618	395	3,679	67	840
November	-	_	765	1.830	654	388	3,637	81	390
December		_	1,003	4.147	1,536	412	7,098	148	450
Тотаі	265	92	7.906	31,729	9,244	3,701	55,937	1.213	420

# III. ALPHABETICAL LIST OF DONORS, AND THEIR DONATIONS DURING 1903.

ADAMS, Mr. Y., Gezira.  1 Patrakeet. Palaornis torquata	25th Jan.
Amster, Dr. R., Sanitary Department, Cairo.  1 Kra Monkey, Macacus cynomolgus	
Anthony, Mr. H. M., Ministry of Finance, Cairo.  1 Grivet Monkey, Cercopithecus athiops	19th June.
BEADNELL, MR. H. J. L., Survey Department, P.W.  1 Desert Fox, Canis famelicus	D. 4th Jan.
BUTCHER, Mrs., Church House, Cairo.  2 White Java Sparrows, Munia oryzivora	2nd Oct.
CATTAUI, MR. GUSTAVE, Cuiro.  1 Fox, Canis vulpes	4th June.
CHAWARHI MOHAMMED PASHA, Legislative Council, 1 Gazelle, Gazella dorcas	Cairo. 23rd Jan.
Coke, Lieut. The Hon. E., Rifle Brigade.  1 Leopard, Felis pardus	1st Aug.
CROMER, RIGHT. HON. THE EARL OF, G.C.B., etc., Carl Crowned Crane, Balearica paronina	iro. 14th March.
DIXON BEY, SANIEH F., C.M.Z.S., Port Said  2 Buff-backed Egrets, Ardra ibis  1 Lesser Black-backed Gull, Larus juscus	11th Jan. 17th May.
	. 6th Jan. . 19th Feb. . 21st March

FLOWER, CAPT. S. S., Giza.  1 Hedgehog, Erinaceus aucitus 19th Feb.
HASSAN BEY TAHIR, Cairo.  1 Imperial Engle, Aquila heliaca 12th April.
Hassan Gaad, Giza.  1 Weusel, Mustela africana 24th March.
Hewens, Mr. J., Sudan Government Railway, Wadi Halfa.  1 Patas Monkey. Cercopithecus patas 16th Dec.
Hosain Haseeb Bey, "Magalat El Mahalut El Arabeia," Cairo.  1 Putas Monkey, Cercopithecus patas 10th Nov.
Humphreys, Mr. H. A., Survey Department, P.W.D.  7 Leith's Tortoises, Testuto leithi,
INNES BEY, Dr. F. WALTER, M.B.O.U., Kasr el-Aini, Cairo.  1 Lanuer Falcon, Falco jeldeygi 1st May.
I D O
Ismain Bey Shakoor, Cairo.  2 Newts, Molge cristata 21st October.
2 Newts, Molge cristata 21st October.  MAHMUD EFFENDI RASMY, Mulazim Awal, Military School, Cairo.
2 Newts, Molge cristata 21st October.  Mahmud Effendi Rasmy, Mulazim Awal, Military School, Cairo.  2 White Storks, Ciconia alba 28th Sept.  Moharrem Bey Abu Gabel.
2 Newts, Molge cristata
2 Newts, Molge cristata

TANZIM SERVICE, Director-General of, P.W.D.  5 Swans. Cygnus olor 2.	8th Nov.
Tolba Ibrahim, Ombashi, Giza.  1 Bat, Rousettus agyptiacus	6th March. 12th Oct.
Wakeling, Dr. J. G., Mena House, Giza.  1 Kite, Milrus agyptius	3rd May.
WALLER, Mr. EDWARD. Youzbashi, Alexandria City I	Police. 27th Dec.

Besides the above donations, the Gardens also received on the 29th Jan. a Catalogue of Birds of Prey in the Norwich Museum from Mr. J. H. Gurney, Keswick Hall, Norwich, England; on the 19th Feb. a Flamingo from an anonymous donor; on the 11th March two maximum and minimum Thermometers from Herr G. Süssman, Mouski, Cairo, and on the 17th and 19th Dec. several plants from Herr Christian Stamm, Bulac-Daerour Road, Giza.

Thanks are also due to the following Foreign Institutions for presenting copies of their publications:—

# Europe.

- Bâle.—Zoologischer Garten in Basel.
   Dr. GOTTFRIED HAGMANN, Direktor.
   (Jahresbericht 1902).
- 2. Dublin.—Royal Zoological Society of Ireland. Dr. R. F. Scharff, Ph.D., B.Sc., F.Z.S., Secretary. (Seventy-first Annual Report.)
- Hague.—Koninklÿk Zoölogisch Botanisch Genootschap.
   N. Dietz, Directeur. (Verslag over het jaar 1902).
- Hamburg.—Zoologischen Gesellschaft in Hamburg.
   Dr. Heisnich Bolau, c.m.z.s., Direktor.
   (Forty-first Annual Report, 1902.)

- Hannover.—Zoologischer Garten. Dr. Ernst Schäff, Direktor. (Report, 1902-1903).
- Leyden.—Rijks Museum van Natuurlijke Historie te Leiden.

Dr. F. A. Jentink, F.M.Z.S., Director. (Verslag, 1902-1903.)

#### Asia.

- Colombo.—Colombo Museum, Ceylon.
   Dr. A. Willey M.A., D.Sc., F.Z.S., Director.
   (Spolia Zeylanica, Vol. 1. Parts, 1, 2 & 3.)
- S. Kuching.—Sarawak Museum, Borneo. R. Shelford, M.A., C.M.Z.S., Curater. (Report for 1901 and 1902).
- 9. Singapore.—Raffles Museum and Library.
  Dr. R. Hanitch, Ph. p., Curator.
  (Report for 1902).
- Taiping.—Perak Museum.
   Keilich, Acting Curator.
   (Report for 1902.)
- 11. Trivandrum.—Trivandrum Government Museum and Gardens, Travancore.

  H. S. Ferguson, F.L.S., F.Z.S., Director.
  (Report for M.E. 1077, 1901-1902.)

#### Australia.

12. Adelaide.—South Australian Zoological and Acclimatization Society.

Alfred C. Mischis, Director. (Twenty-fifth Annual Report, 1902-1903.)

#### America.

13. New York.—New York Zoological Society.
W. T. Hornaday, C.M.Z.S., Director.
(Bulletius, Nos 8, 9, 10 & 11).

Philadelphia.—Zoological Society of Philadelphia.
 ARTHUR ERWIN BROWN, Secretary.
 (Thirty-first Annual Report, 1902-1903.)

#### Africa.

- Pretoria.—Transvaal Museum and Zoological Gardens.
   Dr. J. W. B. Gunning, Director.
   (List of Additions to the Zoological Gardens, Aug. 1902 to April 1903.)
- Cape Town.—South African Museum.
   W. L. Schater, M.A., F.Z.S., Director.
   (Report for 1902).

#### IV. BUILDINGS.

- Lion House, built 1901. This house is proving most satisfactory. Six new Turkish Oak sleeping benches for the animals were added, being paid for out of the balance of the Public Debt Commission's Grant given in 1901. Some small repairs were done to the roof and to six of the small carnivora cages.
- 2. Elephant House, built 1900. This house is also most satisfactory. The pitch-pine bars of the north interior cage were replaced by teak and paid for out of the balance of the Public Debt Commission's Grant of 1901. The north, west and south exterior walls were repainted.
- 3. Tropical House, built 1902. This house appears to answer all its requirements, the heating apparatus works well and is economical of coal. Two glass-sided tanks for water tortoises were provided by the balance of the Public Debt Commission's Grant of 1901. Three strong tables for exhibition tanks were constructed.
- 4. Monkey House.—Originally built about thirty years ago, and not intended for animals; between 1891 and 1896 reconstructed for its present purpose, the authorities in charge at that time did their best, but little money was available and old and inferior materials were employed. By October 1898 the building was in a deplorable state, roof incapable of keeping rain ont, cages incapable of keeping monkeys in, it was extremely draughty, owing to the construction of cages, roof and floor, impossible to theroughly clean or to free from rats. Since 1898 much of the carpenters' and keepers' time has been taken up by constant small repairs, but the condition of the building does not improve. In 1903 the Tanzim Department gave a grant of L.E.25 with which several repairs and small improvements were effected, cambling the building to be still used during the winter of 1903-1904.
- 5. Caracol.—The Ministry of Finance handed over to the Zoological Gardens a piece of land running the whole length of the south side of the Gardens of an area of 1 feddan, 17 kirats, 4 suhm (=1.714 feddans), or 1.779 acres, on the eastern end of which the Caracol stands. This imposing battlemented building creeted as a Guard House to Giza Palace in the reign of H.H. the Khedive Ismail Pasha, and till recently used as a police station,

was handed over to the Gardens on the 1st October, 1903, it was altered and restored so that the central portion now forms the south entrance to the Zoological Gardens, and the wings will eventually give accommodation for store-rooms and work-shops.

- 6. New South Wall —A substantial brick wall with an artificial stone coping was built by the Tanzim Department along the southern boundary of the Gardens including the new strip of land mentioned in the last paragraph and replacing the old wooden fence, which was unsatisfactory as failing to keep out either human or four-footed trespassers.
- 7. Elephant Steps.—Owing to the Elephant having grown taller, the steps erected in 1900 for people wishing to ride on his back, were made nearly two feet (60 centimetres) higher, by the Tanzim Department.
- 8. Bear House.—The alterations carried out in 1902 have proved very satisfactory.
- 9. Director's House.—The interior of the Office and dining-room were repainted.
- 10. Hyæna House.—The western exterior cage was repayed with hard Triesre stone laid in cement.
- 11. African and 1899 Aviaries.—These buildings have answered their purpose satisfactorily, but as the collection of birds grows, are becoming too crowded. Three leaks appeared in the tanks of the African Aviary, which were consequently remired.
  - 12. Birds of Prey Cages.—A row of seven old cages in the Haremlik Garden were demolished, and an entirely new cage begun to be built on the site, with a wooden floor raised 29 inches (72 centimetres) off the ground. The interior dimensions of the new cage are approximately:—length 93 feet (2840 metres), width 11½ feet (3.50 metres.) height 9% feet (3 metres).
  - 13. Ibex Enclosure.—The Ibex having several times broken out of their paddock; the fence, which is about 212 yards (194 metres) long was repaired and strengthened.
  - 14. Paddocks.—Small repairs and improvements were carried out in the north-western, Central and Selamlik Paddocks.

- 15. New Cages were built for small birds and monkeys near the South Gate and for jackals near the Lion House, and ones for oribi near the Director's House and for alligators near the Citadel Grotto were commenced.
- 16. Garden Seats.—Forty new wooden seats for visitors were put up in various parts of the Gardens.
- 17. Pavements in Haremlik Garden.—The work of repairing the marble and mosaic-work pavements was continued but makes slow progress.
- 18. Paths in Selamlik Garden.—The paths leading to the South Gate were relevelled, sanded, rolled and edged with pieces of Trieste stone set on end to form an irregular "dog tooth" pattern.
- 19. Bridges.—Four of the bridges over the Schaulik Canal were repaired and required, work argently required as nothing had been done to these bridges since they were first erected rather over thirty years ago.
- 20. Labels, etc.—37 new zoological and 3 new botanical labels were painted and put up, and 20 old zoological labels repainted. Two propagating frames for the Nursery Garden, three cupboards, a collapsable travelling cage for antelopes, and two parrot stands were also made by the carpenter.

# V. ANIMALS.

# (i) Number of Animals alive in Gardens.

	6th C		6th C		6th C		6th C	- 1	6th C		6th 0	
Mammuls.	Specimen.	Rpschie.	Npeciment.	Вресии.	Specialism	Specien	Springeren.	Species.	Pprcimma.	Specina.	Sputanesa.	Specime.
Primates Carnivora Insectivora Chiroptera Rodentia Ungulata Edentata Marsupialia Total Mammals	59 25 - 46 1 5 136	15 12 - - 17 1 5	66 39 8 2 4 50 1 2 172	15 13 1 1 4 14 14 2 51	80 67 2 2 16 82 1 9	19 20 1 1 20 1 20 1 6	66 46 3 2 6 81 1 6	19 17 1 2 4 18 1 4	69 66 10 12 25 100 1 4 287	17 29 1 2 7 25 1 3	73 57 4 16 21 115 1 4 291	15 20 2 3 8 24 1 3
Birds.	100											
Passeres Psittaci Striges Accipitres Steganopodes Herodiones Anseres Columbæ Pterocletes Gallinæ Fulicariæ Alectorides Limicolæ Gaviæ Casmarii Struthiones	16 1 1 24 30 1 38 — — — 2 3	1 6 - 1 1 1 8 8 8 1 1 1 1 - 1 2 1 2 1 4 7	55 30 18 24 5 40 30 6 49 1 - 3 25 268	8 2 3 3 11 7 2 2 11 — 1 1 1 1 1 666	60 50 7 87 -1 -3 2 7	10	177 66 61 45 23 125 1 12 12 12 3	10	74 44 48 15 21 63 60 21 117 117 117 117 117 117 117 117 117		92 33 33 15 30 43 81 15 81 15 82 44 4 4 4 7	14 3 8 10 7 1 10 2 3 2 1 - 2
Reptiles.  Chelonia Emydesanria Squamata Total Reptiles  Batrachiaus		1 - 1 - 1 - 1	13 2 16 31	14	24 2 15	17	93		4-		9 41	11
GRANII TOTAL	-	98	473	132	670	163	770	179	(12)	3 21	959	222

(ii). The following seventy-one species of birds have visited the Gardens of their own accord during the years 1899 to 1903.

1st Species found wild in Egypt.

- 1. Song Thrush, Turdus musicus.
- 2. Blackbird. Turdus merula.
- 3. Redstart, Ruticilla plarnicurus.
- 4. ? Black Redstart, Ruticilla titys.
- 5. Blue-throated Warbler, Cyanerula succica.
- 6. Robin Redbreast, Erythneus rubecula.
- 7. ? Nightingale, Danlins luscinia.
- 8. Subalpine Warbler, Sylvia subalpina.
- 9. Blackcap Wurbler, Sylvia atricapilla.
- 10. Willow Warbler, Phylloscopus trochilus.
- 11. Chiffelaff Warbler, Phylloscopus collybita.
- 12. Olivaceous Warbler, Hypolais pullida.
- 13. Rufous Warbler, Acidon galactodes.
- 14. Graceful Wren-Warbler. Prinia gracilis.
- 15. ? Nuthatch, Sitta sp.
- 16. White Wagtail, Motacilla alba.
- 17. Grey Wagtail, Motacilla melanope,
- 18. Golden Oriole. Oriolus gallada.
- 19. Masked Shrike, Lanius aubicus,
- 20. Pied Flyentcher, Muscicapa atricapilla.
- 21. ? Chimney-Swallow, Hirundo rustica.
- 22. Egyptian Chimney-Shallow. Hirondo sacigni.
- 23. House-Sparrow. Passer damesticus.
- 24. Chaffinch, Fringilla calelis.
- 25. ? Corn-Bunting. Emberica miliacia.
- 26. Cretzschmar's Bunting, Emberiza caria.
- 27. Short-toed Lark, Calandrella brachydaetyla.
- 28. Hooded Crow, Carrus cornir.
- 29. ? Egyptian Nightjar, Caprimulgus agyptius.
- 30. Kingfisher. Alcedo ispida.
- 31. Pied Kingfisher, Ceryle rudis.
- 32. Roller, Caracias garculus.
- 33. Bee-enter. Merops apiaster.
- 31. Ноорое, Uрира гроря.
- 35. Southern Little Owl. Athene glaux.
- 36. Barn-Owl, Strix flammed.
- 37. Sparrow-Hawk. Acripiter nisus.
- 38. Peregrine Fulcon, Falco percycinus.
- 39. Kestrel, Falco tinnunculus.

- 40. Egyptian Kite, Mileus agyptius.
- 11. Egyptian Vulture, Neophron perenopterus.
- 42. Pelican, Pelecauns onocrotalus.
- 43. Grey Heron, Ardea cinerea.
- 44. Purple Heron, Anlea purpurea.
- 15. Little Egret, Andea garzetta.
- 46. Night-Heron, Nyeticorax griseus.
- 47. White Stork, Cironia alba.
- 48. Spoonbill, Platalea lencorodia.
- 49. Wild Duck, Anas boseas,
- 50. Pintail Duck, Anus genta.
- 51. Shoveller, Spatula elypeata.
- 52. Teal. Querquedula creccu.
- 53. Tufted Duck, Fuligala cristata.
- 54. ? Red-crested Pochard, Fuligula rafina.
- 55. Pochard, Fuligala ferina.
- 56. White-eyed Duck. Fuligula nyroca.
- 57. Rock-Dove, Columba livia.
- 58. ? Turtle-Dove. Turtur auritus.
- 59. Palm Dove. Turtur senegalensis.
- 60. Water-Hen, Gallinda chloropus.
- 61. Coot, Fulica atra.
- 62. ? Demoiselle Crane, Graz rirgo.
- 63. Stone-Curlew. (Edichemus scolopas.
- 64. Lapwing, Vanellus vulgaris.
- 65. Woodcock, Scolopus rusticola.

At least two more species of Warblers have been seen but not identified, and the European Nightjar. Osprey, Lesser Kestrel and Grey Crane are believed to have occurred. A query has been placed before nine species in the above list as although the identifications are believed to be correct they rest on less certain evidence than the majority of species enumerated.

2nd foreign species which presumably must have escaped from captivity elsewhere in Egypt.

- 1. Red-headed Wenver Bird, Ploceus madagascaricusis.
- 2. Striated Finch, Munic striata.
- 3. Java Sparrow, Munia oryzirora.
- 4. Green Parrakeet, Palwarais tarquata or P. docilis.
- 5. Larger Green Parrakeet. Palaornis ap. 1
- 6. Grey-hended Love-bird, Agapornis cana.

A manuscript record has been kept of the dates when each species was noted in the gardens, and of the number of individuals observed, which in most cases are found to be increasing from year to year; the Haremlik Lake is the favourite resort of the wild fowl, 171 Shovellers have been counted there at once, and 360 Night Herons, in 1902 the largest number of Teal counted on the lake at one time was 130, in 1903 it was 171, and on the 25th February 1904, there were 283 Teal there.

The following snakes were caught in the gardens during 1903, all were small and harmless.

- Thirteen Glauconia cairi (6th, 22nd and 27th Feb., 9th, 22nd [five specimens], 23rd and 26th March, 10th April and 1st May); the specimen found on the 6th February was 247 m.m. in length.
- 2. Two Zamenis florulentus (19th April and September).
- 3. One Psammophis sibilans. (11th April).
- 4. Three Tarbophis obtusus (4th, 9th and 31st October).

## (iii.) Registered additions to the Menagerie :-

	1899	1900	1901	1902	1903
Acquired by presentation, ,, purchase	98 515 27 26 5	103 209 31 11 17	74 343 25 27 5	103 126 64 39	48 309 81 13 10
Total	671	371	474	338	461

Of the additions during 1903 the following should be specially mentioned:

The fine pair of Grevy's Zebras Equus grevyi deposited on the 7th March by the Zoological Society of London to whom they had been presented by Lient. Col. J. L. Harrington, c.b.,c.v.o., and several additions to the collection of Egyptian birds, including the Little Bittern, Purple Coot, Corn-Crake, Lapwing, etc.

- (iv). The following were bred in the Gardens during 1903 :-
  - 1. Dusky Lemur, Lemur fulrus, 1 (born 6th June).
  - Northern Genet, Genetta vulgaris. 2 (born 27th July, died suddenly 26th October).
  - Egyptian Jackal, Canis lupaster. 11 (litter of 4 31st March and one of 7 21st April; none were reared).
  - 4. Cairo Spiny Monse, Acomys cahirinus, numerous.

- 5. Dorcas Gazelle, Gazella dorcas. 7 (of which 4 died before the end of the year).
- 6. Arabian Gazelle, G. arabica. 1 (born 6th Feb. died 8th May).
- 7. Arial, G. sommerringi. 3.
- 8. Angora Goat, Capra hireus var. 1.
- 9. Circassian, Goat, Capra hireus var. 1.
- 10. Ibex, Capra nubiana (pure-bred and hybrids) 9 (of which 2 died before end of year).
- 11. Sudan Sheep, Ovis aries var. 2.
- 12. Hedjaz Sheep. Oris aries var. 4.
- 13. Arui Wild Sheep, Ocis lervia. I (born 17th June, died same day).
- 14. Griffon Vulture, Gyps fulvus. 1 (hatched 9th June, died 2ud September).
- 15. Silver Pheasant, Euplocamus ayethemurus. 3 (hatched 1st May, one died 21st September).
- 16. Laughing Dove, Turtur risorius. 16.
- 17. Palm Dove, Turtur senegalensis, 11.
- 18. Central African Dove, Turtur decipiens. 7.

Unless otherwise stated the above were successfully reared, as were also Turkeys, Gninea Pigs, Rabbits, etc.

#### (v) Registered departures from the Menagerie :-

	1899	1900	1901	1902	1903
Sent away from the gardens, for various causes.  Disappeared (mostly small birds).  Killed by wild foxes, cats, rats, etc  Accidental deaths from animals injuring themselves, or each other  Deaths from natural causes	10 27 24 16 233	23 21 21 21 10 194	27 6 20 19 210	\$8 33 6 16 196	60 23 - 20 235
Total	310	269	282	339	338

No important animals died during the year. The twenty accidental deaths include nine Jackal puppies caten by their mothers, a Lion cub which cheked itself eating a piece of ment, an Angora Goat which fell into a canal and was drowned, and several animals and birds which met their deaths fighting their companions in the same eages.

The disappearances include several ducks which may have been carried off by foxes or wild-cats.

The number of deaths in each month was :-

				1889	1900	1901	1902	1903
February March April				33 22 11 17 19 14 16 11 14 30 31	15 15 15 12 19 18 14 5 11 17 19 34	19 18 11 11 12 13 11 18 21 17 23 26	26 14 18 11 8 12 14 13 12 18 20 30	25 17 8 15 15 18 11 20 21 24 17 44
		Total	 4 =	233	194	210	196	235

Of these 235 animals there were:

- 45 monkeys.
- 9 lemnrs.
- 45 other mammals.
- 98 birds.
- 38 reptiles.

Thirty-eight of the above died within one month of arriving in the Gardens, and twenty-seven between one and three months of their arrival.

Six of the nine lemmes died of dysentery (ulcerative colitis) between the 11th January and 26th February, one died from the result of an accident, one apparently from old age and the remaining one from unknown causes.

Several of the monkeys died of dysemery about the same time as this disease appeared among the lemurs; three died of tuberculosis; others of pneumonia and severe constitution, but as usual in many cases it was impossible to determine the cause of death, all the organs appearing healthy.

- Dr. G. Elliot Smith, Cairo School of Medicine, kindly made postmortem examinations of a large number of the animals that died.
- (vi) A list of the species and varieties of Animals which have been exhibited alive in the Egyptian Government's Zoological Gardens at Giza, from 6th October 1898 to 4th March 1904.

Those species which occur wild in, or are domesticated in, Africa and its adjacent islands, including Madagascar, are marked with an asterisk.

# Class Mammalia.

# ORDER PHIMATES.

	Family Simiidae.	
1. S	imia satyrus Linneus	Mins, or Orang Utan.
	Family Cercopithecidæ.	
2. 8	emnopithecus entellus (Dufresne)	Langur, or Hanuman, Monkey.
3.	obscurus, Reid	Dusky Leaf-Monkey.
4.	cephalopterus(Limmermann)	Purple-faced Monkey.
5. 3	Vasalis larvatus (Wurmb)	Proboscis Monkey.
• 6. 0	Cercocebus fuliginosus, E. Geoffroy	Sooty Mangabey.
• 7. (	Cercopithecus athiops (Linnaus)	Grivet Monkey.
• 8.	pygerythrus, F. Cuvier?	Vervet Monkey?
• 9	patas (Schreber)	Patas Monkey.
*10.	albigularis, Sykes	Sykes's Monkey.
	Macacus sinicus (Linnsens)	Bonnet Monkey.
12.	., pileatus (Shaw)	Toque Monkey.
13.	cynomolous (Linnæns)	Kra, or Macaque Monkey.
14.	nemestrinus (Linnæns)	Broh, or Pig-tailed Monkey.
15.	rhesus (Audebert)	Bandar, or Bengal Monkey.
16.	maurus, F. Cuvier	Moor Macaque Monkey.
*17.	inuus (Linnæus)	Barbary, or Rock Ape.
18.	Cynopithecus niger (Desmarest)	Black Ape of Celebes.
*19.	Papio hamadryas (Linneus)	Arabian, or Sacred Baboon.
*20.	" anubis (Fischer)	Annbis Baboon.
*21.	" cynocephalus (Linnæus)	Yellow Baboon.
	Family Cebidæ.	
22.	Celus hypoleucus (Humboldt)	White-throated Capuchin
	• •	Monkey.
	Family Lemuridae.	
•92	Lemur carius, Isidore Geoffroy	Ruffed Lemur.
*24.	macico (Linnæus)	Black Lemur.
• 25.	nigerrimus, Sclater	Very Black Lemur.
*26.		Dusky Lemur.
•27.	coronatus, tirny	Crowned Lemur.
-28.	catta, Linnseus	. Ring-tailed Lemur.
	Nycticebus tardigradus (Linnæns)	. Slow Loris.
30.	Loris gracilis, E. Geoffroy	. Slender Loris.
4,00		

# ORDER CARNIVORA.

Family Felidæ.	
*31. Felis leo, Linnæus	Lion.
	Tiger.
*33 pardus, Linnsons	Leopard, or Panther.
*34 serval, Schreber	Serval.
*35. " chaus, Güldenstädt	Jungle Cat.
*36. , libyat, Meyer	Fettered Cat.
*37. domestica, Brisson	The Cat.
*38. " caracal, Güldenstädt	Caracal.
*39. Cynarlurus jubatus (Erxleben)	Chita, or Hunting Leopard
Family Viverridæ.	
*40. Virerra ciretta (Schreber)	African Civet-Cat.
*41. malaccensis, J. F. Gmelin	Rasse Civet-Cat.
*42. Genetta vulgaris (Lesson)	Northern Genet.
.43. " senegalensis (Fischer)	Pale Gener.
44. Paradoxurus hermaphroditus (Pallas)	Malay Palm Civet-Cat.
*45. Herpestes ichneumon (Linnæns)	Fgyptian Mongoose.
*46. Crossarchus zebra, Rüppell	Zebra Mongoose.
Family Hyænidæ.	
	Spotted Hymna.
*47. Hyuna crocuta (Erxleben)	Ct. 1 II.
*48. " striata, Zimmermann	Dillien aricona
Family Canidae.	
49. Canis familiaris, Linuwus	The Dog.
*50 lupaster, Hemprich & Ehrenberg	Egyptian Jackal.
*51. , authus, F. Cuvier, car. soula-	Sudanese Jackal.
nicus, Thomas	Black-backed Jackal.
*52 mesomelas, Schreber	The Fox.
*53. " rulpes, Linneus	Sand Fox.
•54. " famelicus, Cretzschmar	Fennec Fox.
*55. " zerda, Zimmermann	rennec rox.
Family Mustelidæ.	
56. Mustela putorius, Linnaens, rar. furo,	Ferret.
Linnæns	T Cl t Cto
ost. "cana, Desmarest	Egyptian Weasel.
*58. Ictonyx libyca (Hemprich & Ehrenberg)	Libyan Striped-Weasel.
59. Meles taxus (Boddaert)	Budger.
Mail Street America	

#### Family Ursidæ.

- 60. Ursus arctos, Linnaus ... ... Brown Bear.
- 61. "Hemprich & Ehrenberg ... Syrian Bear.
- 62. "Pucheran? " var. piscator, Fishing Bear?
- 63. " malayanus, Raffles ... ... Malay, Sun or Honey Bear.
- 64. Melursus ursinus (Shaw) ... ... Sloth Bear.

#### ORDER INSECTIVORA.

## Family Erinaceidæ.

\*65. Erinaceus auritus, S. G. Gmelin ... Long-eared Hedgehog.

## Family Soricidæ.

\*66. Crocidura olivieri (Lesson) ... ... Olivier's Shrew.

#### ORDER CHIROPTERA.

#### Family Pteropodidæ.

- \*67. Rousettus agyptiacus (E. Geoffroy) ... Egyptian Fruit-Bat.
- \*68. collaris (Illiger) ... Collared Fruit-Bat.

# Family Rhinolophidæ.

\*69. Rhinolophus antinori, Dobson ... ... Antinori's Horseshoe Bat.

# Family Nycteridae.

\*70. Nycteris thebaica, E. Geoffroy ... Theban Long-eared Bat.

# Family Vespertilionide.

- \*71. Otonycteris hemprichi, Peters ... ... Hemprich's Long-eared Bat.
- •72. Pipistrellus kuhli (Natterer) ... Kuhl's Pipistrelle Bat.

## Family Emballonuridæ.

- \*73. Taphozous mulirentrie, Cretzschmar. Sheath-tailed Bat.
- \*74. Rhinopoma microphyllum (Briinnich). Long-tailed Bat.
- \*75. Nyctinomus ogyptiacus, E. Geoffroy. Wrinkled-lipped Bat.

#### ORDER RODENTIA.

## Family Sciuridae.

76. Sciurus prevosti, Desmarest ... ... Raffles's Squirrel.

## Family Mnridæ. Lesser Egyptian Gerbille. \*77. Gerbillus orgyptius, Desmarest ... ... Greater Egyptian Gerbille. " pyramidum, Isidore beaffroy ... Fat-tailed Gerbille. \*79. Pachyuromys dupresi, Lataste ... ... The Rat. \*80. Mus rattus, Linnæus ... ... ... Norway Rat. \*81. " narvegicus, Erxleben ... ... The Mouse. \*82. " musculus, Linnæns ... ... \*83. " niloticus (E. Geoffroy) ... ... Nile Rat. Cairo Spiny Mouse. \*\$4. Acomys cahirinus (E. Geoffroy) ... Family Dipodide. \*85. Dipus juculus (Linnæus) ... ... Lesser Egyptian Jerboa. Greater Egyptian Jerboa. gerlux, Olivier ... ... Family Hystricidæ. ... Crested Porcupine. \*87. Hystrix cristata, Linnæus " leucura, Sykes ... ... Indian Porcupine. longicauda, Marsden ... Malay Porcupine. 89. 29 Family Caviidae. ... Domestic Cavy, Guinea-Pig. 90. Cavia porcellus (Linnæns) Family Leporidae. 91. Lepus cuniculus, Linnæns ... ... The Rubbit. •92. " agyptius, Desmarest? ... Egyptian Hare. ORDER UNGULATA. Family Procaviidae. \*93. Procavia sp. incert. ... ... ... Egyptian Hyrax. Family Elephantidae. 94. Elephas indicus, Cuvier ... ... Indian Elephant. Family Equide.

\*95. Equus caballus, Linnaens ... ... The Horse.

n rar. a/ricanus

\*98. Equus greeyi, Milne-Edwards ... Grevy's Zebra.

.97.

r asinus, Linnæus ... ... The Ass, or Donkey.

Fitzinger ... ... ... African Wild Donkey.

# Family Bovidæ.

• 99. Bos taurus Linnwus	The Ox.
9 19	Indian Ox, or Zehu.
100 iralicus	Nuer Ox.
	The Buffalo.
*103. Ourebin montana (Rüppell)	Oribi.
*104. Colors defassa (Rüppell)	Waterbuck.
*105. Gazella dorcas (Linnens)	Dorcus Gazelle.
nan jarhella	
Gray	Isabella Gazelle.
*107. Gazella ptilonura (Heuglin)?	Von Henglin's Gazelle?
*108. " rujijrons, Gray	Korin Gazelle.
109. " arabica (Hemprich & Ehrenberg)	Arabian Gazelle.
110 subgutturosa (Güldenstädt)	Persian Gazelle.
*111. " semmerringi (Cretzschmar).	Arial, or Aoul.
112. Antilope cervicapra (Linnieus)	Indian Antelope, or Black Buck.
*113. Hippotrugus equinus (Desmarcst)	Roan Antelope.
*114. Orya leucorya (Pallas)	Salire-horned Antelope.
*115. Addax nasomaculatus De Blainville)	Addax.
*116. Strepeiceros kudu Gray	Greater Kudn.
*117. Capra hircus Linnaus var.?	Egyptian Goat.
*118.	Sudanese Goat.
119.	Bornean Goat.?
120	Angora Goat.
121	Circassian Goat.
*122. Capra nubiant F. Cuvier	Nubian Ibex.
*123. Ovis aries Linnens var.?	Egyptian "Bahrowi" Sheep.
*124.	Sudanese Roman-nosed Sheep.
125	Hedjaz Black-headed Sheep.
•126.	Wau Short-tailed Sheep.
127. Ocis lervia (Pallas)	Arni, or Barbary Wild Sheep.
Family Giraffidæ.	
*128. Girafia camelopardalis (Linmens)	Giraffe.
Family Cervidae.	
	I
129. Cercus elaphus (Linntons) var. mara	
Gray	D. L Duen Door
	Mint on Spotted Door
	E-Hom Dogs
*132 dama Linneus	

Fa	mil	v T	ragu	ilie	læ.
			6.22		

133. Tragulus meminna (Erxleben) ... Indian Mouse Deer.

## Family Camelidæ.

- 134. Lama huanacos (Mol.) ... ... Huanaco, or Wild Lama.
- 135. Camelus dromedarius Linnens ... Arabian Camel.
- 136. . bactrianus Linnæns... ... Bactrian Camel.

#### Family Suidæ.

- \*137. Phacocharus africanus (Ginelin) ... (Elian's Wart Hog.
- 138. Sus cristatus Wagner ... ... Asiatic Wild Swine.
- 139. Babirusa alfurus Lesson... ... Babirusa.

#### ORDER EDENTATA.

#### Family Dasypodidae.

140. Dasgpus villosus Desmarest ... ... Hairy Armadillo.

#### Family Orycteropodidæ.

\*141. Orycteropus athiopicus Sundevall... Ethiopian Ant-Bear.

#### ORDER MARSUPIALIA.

#### Family Macropodidæ.

- 142. Macropus giganteus Shaw ... Great Kangaroo.
- 143. .. melanops Gould ... Black-faced Kangaroo.
- 144. .. robustus Gould... ... Wallaroo.
- 145. .. unlabatus (Less.and Garn.) Black-tailed Wallaby.
- 146. .. derbianus (Gray) ... Derbian Wallaby.
- 147. Petrogule penicillata Gray ... Brush-tailed Wallaby.

#### Family Phalangeridae.

148. Trichosurus vulpecula (Kerr)... ... Australian Opossum or Phalanger.

#### Family Phascolomyidae.

149. Phascolomys mitchelli Owen ... Wombat.

#### Class Aves.

#### ORDER PASSERES.

#### Family Turdida.

1. Turdus musicus Linnæus ... Song-Thrush.

<ul> <li>2. Monticola saxatilis (Linnæns) Rock Thrush.</li> <li>3. Ruticilla phunicurus (Linnæns) Redstart.</li> <li>4. Daulias luscinia (Linnæns) Nightingale.</li> </ul>
Family Motacillidae.  5. Motacilla alba, Linnaeus White Wagtail.  6. Anthus trivialis (Linnaeus) Tree-Pipit.
Family Pycnonotidæ.  7. Pycnonotus xunthopygus (Hemprich & Ehrenberg) Syrian Bulbul.
* 8. Muscicapa collaris, Bechstein White-collared Flycatcher.
Family Ploceidee.  9. Estrelda amandava (Linnæns) Amaduvade Finch.  10. , cinerea (Vieillot) Grey Waxbill.  11. , phanicotis, Swainson Cordon Bleu, or Crimson-eared Waxbill.  12. , senegala (Linnæns) var. brunneiceps (Sharpe) Fire Finch.  13. Munia nana (Pucheran) Dwarf Finch.  14. , ultramarina (J. F. Gmelin) Ultramarine Finch.  15. , fasciata (J. F. Gmelin) Cut-throat Finch.  16. , punctulata (Linnæus) Nutmeg Bird, or Spice Finch.  17. , malacca (Linnæus) Three-coloured Finch.  18. , atricopilla (Vieillot) Black-headed Chestnut Finch.  19. , maja (Linnæus) White-headed Finch.  20. , striata (Linnæus) Striated Finch.  21. , "domestica" Beugalee Finch.  22 malabarica (Linnæus) Silver-bill Finch.  23 oryzivora (Linnæus) Java Sparrow.  24. Erythrura prusina (Sparrman) Fire-tailed Finch.  25. Vidua paradisea (Linnæus) Puradise Whydah-bird.  26. , principalis (Linnæus) Pin-tailed Whydah-bird.  27. Ploceus madagascariensis (Linnæus) Red-headed Weaver Bird.  28. , baya, Blyth Yellow-headed Weaver Bird.
Family Fringillidæ.  29. Paroaria cucullata (Latham) Red-crested Cardinal.  *30. Passer domesticus (Linnæns) House Sparrow.  *31. Coccothraustes vulgaris, Pallas Hawfinch.

*33. Fringilla carlebs, Linnæns	Greenfinch. Thaffinch. Goldfinch. Siskin. Canary. Linnet. Persian Desert Bullfinch.
*39. Emberiza kortulana, Linnæns	Ortolan Bunting.
Family Sturnide.	
*40. Sturnus vulgaris, Linnwus	Starling. Rose-coloured Starling. Malabar, or Grey-headed Myna-bird.
20) 2111 000000	The Myna-bird.
44. Eulabes religiosa (Linnæus)	Pious Myna-hird.
Family Corvida.	
-	Jackdaw.
·46 cornix, Linnæus	Hooded Crow.
*47. " umbrinus, Sundevall?	Brown-necked Raven?
Order Picar	1.4.
On the second	8 4 8 9 9
Family Picidae.	8.800
Family Picidæ.	Spotted-breasted Pied
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)	Spotted-breasted Pied Woodpecker.
Family Picidae.  48. Dendrocopus pectoralis (Blyth) Family Upupidae.  *49. Upupa epops, Linnaus	Spotted-breasted Pied Woodpecker.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  •49. Upupa epops, Linnans  Family Coraciidæ.	Spotted-breasted Pied Woodpecker. Hoopoe.
Family Picidae.  48. Dendrocopus pectoralis (Blyth) Family Upupidae.  *49. Upupa epops, Linnaus	Spotted-breasted Pied Woodpecker. Hoopoe.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  •49. Upupa epops, Linnans  Family Coraciidæ.	Spotted-breasted Pied Woodpecker.  Hoopoe.  Roller.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  *49. Upupa epops, Linnæns Family Coraciidæ.  *50. Coracias garralus, Linnæns  Order Psitt	Spotted-breasted Pied Woodpecker.  Hoopoe.  Roller.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth) Family Upupidæ.  *49. Upupa epops, Linnæns Fumily Coraciidæ.  *50. Coracias garralus, Linnæns  Order Psitt	Spotted-breasted Pied Woodpecker.  Hoopoe.  Roller.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  49. Upupa epops, Linnæns  Fumily Coraciidæ.  *50. Coracias garrulus, Linnæns  Order Psitt  Family Loriidæ.  51. Eos rubra (J. F. Gmelin)	Spotted-breasted Pied Woodpecker.  Hoopoe.  Roller.  Red Lary.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  *49. Upupa epops, Linnæns  Fumily Coraciidæ.  *50. Coracias garradus, Linnæns  ORDER PSITT  Fumily Loriidæ.  51. Eos rubra (J. F. Gmelin)  52. "riciniata (Bechstein)	Spotted-breasted Pied Woodpecker.  Hoopoe.  Roller.  Red Lory. Violet-necked Lory.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  *49. Upupa epops, Linnæns  Fumily Coraciidæ.  *50. Coracias garralus, Linnæns  ORDER PSITT  Family Loriidæ.  51. Eos rubra (J. F. Gmelin)  52. "riciniata (Bechstein)  53. Lorius flavo-palliatus (Reichenow)	Spotted-breasted Pied Woodpecker.  Hoopoe.  Roller.  Red Lary.
Family Picidæ.  48. Dendrocopus pectoralis (Blyth)  Family Upupidæ.  *49. Upupa epops, Linnæns  Fumily Coraciidæ.  *50. Coracias garradus, Linnæns  ORDER PSITT  Fumily Loriidæ.  51. Eos rubra (J. F. Gmelin)  52. "riciniata (Bechstein)	Spotted-breasted Pied Woodpecker.  Hoopoe.  Roller.  Red Lory. Violat-necked Lory. Yellow-backed Lory.

Fumily Cacatuidee.
55. Cacatua galerita (Lathum) Greater Sulphur-crested Cockatoo.
56. * sulphures (J. F. Gmelin) Lesser Sulphur-crested Cockatoo.
57 Leadbeater's Cockatoo
59 moluccensis (J. F. Gmelin). Rose-crested Cockatoo. 60. gymnopis, Sclater Bare-eyed Cockatoo. Ducorp's Cockatoo.
62. "roseicapilla, Vieillot "Roseate Cockatoo.  83. Liemetia nasica (Temminek) Slender-billed Cockatoo.
64 Calopsitlacus nove-noralista (viviania)
Family Psittacide.  65. Ara araraum (Linneus) Blue-and-Yellow Macaw.  66 unicao (Linneus) Red-and-Blue Macaw.  67. Conurus minday (Desmarest) Blue-hended Conure.  68. Chrysotic astiva (Linneus) Blue-fronted Amazon-Parrot.  69. vehrocephala (J.F. Gmelin) Yellow-fronted
D. month
71 salvini, Salvadori Salvin's Amazon-Parrot.  *72. Psittacus erithacus, Linnæus Grey-Parrot.  *73. Coracopsis vesa (Linnæus) Greater Vasa Parrot.
74. Relectus roratus (1. E. S. Marto)  75. "westerman's Noble-Parrot.  76. Tanygnathus megalorhynchus (Boddart) Great-billed Parrot.
77. Palaornis torquata (Boddaert) Ring-necked I arrakoet.  78. docilis (Vicillot) Rose-ringed Parrakeet.
80. rosa (Boddaert) Rosy Parrakeet.  81. fasciata (P. L. S. Müller) Banded Parrakeet.
82 Large Ceylonese Parrakeet.
*85. Agapornis cana (J. F. Gmelin) Grey-headed Love-bird.  *86. roseicollis (Vieillot) Rosy-faced Love-bird.
88. barnardi (Lutham) Barnard's Parrakeet. 89. multicolor (Temminek) Many-colonred Par akeet.
90. Melopeittacus undalatus (Slaw) Budgerigar.

#### ORDER STRIGES.

## Family Strigidae.

• 91. Strix flammea Limmeus ... ... Barn-Owl.

#### Family Asionida.

- \* 92. Bubo ascalaphus (Savigny) ... ... Egyptian Eagle-Owl.
- \* 93. Athene glaux (Savigny) ... ... Southern Little Owl.

#### ORDER ACCIPITRES.

# Family Falconida.

• 94.	Pandion haliactus (Linnaus)		Osprey.
* 95.	Circus irruginosus (Linnæus)		Marsh-Harrier.
• 96.	" sicainsuni Smith		Pallid Harrier.
= 97.	Butco desertorum (Daudin)		African Buzzard.
* 98.	" jerox (S. G. Gnielin)		Long-legged Buzzard.
• 99.	Haliaetus albicilla (Linnaus)		White-tailed Eagle.
° 100.	Aquila beliaca Savigny		Imperial Eagle.
*101.	" rapar (Tenninck)		Tawny Engle.
*102.	, maculata (J. F. Gmelin)		Spotted Engle.
*103.	Hiraetus fasciatus (Vieillot)		Bonelli's Eagle.
*104.	Accipiter nisus (Linnaus)		Sparrow-Hawk.
*105.	Falco peregrinus Tunstall		Peregrine Falcon.
*106.	feldeggi Schlegel		Lanuer Falcon.
*107.			Red-legged Falcon.
*108.	, tinnunculus Linnæus		Kestrel.
*109.	cenchris Naumann		Lesser Kestrel.
*110.	Milrus migrans (Boddaert)		Black Kite.
*111.		• • •	Egyptian Kite.
*112.			Cinercons Vulture.
*113.	,, auricularis Dandin		Sociable Vulture.
*114	Gyps juleus (J. F. Gmelin)		Griffon Vulture.
•115.			Rüppell's Vulture.

# Family Serpentariidæ.

\*117. Serpentarius gambiensis Ogilby ... Northorn Secretary Bird.

\*116. Neophron percnopterus (Linnwus) ... Egyptian Vulturo.

#### ORDER STEGANOPODES.

## Family Pelecanida.

- \*118. Pelecanus onocrotalus Linnuus ... White Pelican.
- \*119. . . . crispus Bruch. . . . . Dalmatian Pelican.
- \*120. rufescens J. F. Gmelin ... Red-backed Pelican.

## Family Phalacrocoracide.

\*121. Phalacrocorax graculus Linuxeus ... Sling, or Crestel Cormorant.

#### ORDER HERODIONES.

## Family Ardeidae.

- \*122. Ardea cinerea Linnæus ... ... Grey Heron.
- \*123. " purpurea Linnens ... ... Purple Heron.
- \*124. " goliath Cretzschmar ... ... Goliath Heron.
- \*125. .. ibis Linnæus ... ... Buff-backed Heron.
- \*126. Ardetta minuta (Linuxeus) ... Little Bittern.
- \*127. Nycticorax griseus (Linuseus) ... Night-Horon.

#### Family Balænicipitidæ.

\*128. Balaniceps rex Gould ... ... Shoebill.

# Family Ciconiidae.

- \*129. Ciconia alba Bechstein ... ... White Stork.
- \*130. Leptoptilus erumeniferus (Cuvier) ... Marabon Stork.

#### ORDER ANSERES.

#### Family Phonicopterida.

\*131. Phænicopterus roseus Pallas ... ... Flamingo.

#### Family Anatidae.

- \*132. Cygnus olor (J. F. Gmelin) ... Mute Swan.
- 133. , atratus Lathum ... ... Black Swan.
- \*134. Plectropterus rueppelli Schater ... Rüppell's Spur-winged Goose.
- \*135. Cairina moschata (Linnœus) ... Muscovy Duck.
- 136. Æx sponsa (Linnæus) ... ... Summer Duck.
- 137. " galericulata (Linnueus) ... ... Mandarin Duck.
- \*138. Dendrocygna viduata (Limmens) ... White-faced Tree-Duck.
- \*139. Chenalopex agyptiacus (Linnæus) ... Egyptian Goose.

•140. Tadorna cornuta (S. G. Guelin) .	Burrow Sheldruke.
•141. " casarca (Linneus)	Ruddy Sheldrake.
142. Anas boscas Linnieus	Wild Duck, or Mallard.
*143. " strepera Linnaeus	Gaelwall.
*144 penelope Linuarus	Wigeon.
*145 acuta Linnaus	Piutail Duck.
*146. Overquedula crecca (Linnaus)	The Teal.
*147. Spatula elypeata (Liunæus)	Shoveller.
*148. Fuligula cristata (Leach)	Tufted Duck.
*149, rujina (Pallas)	Red-crested Pochard.
•150. " ferina (Linnæus)	Poehard, or Dun-Bird.
*151. Erismalura leucocephala (Scopoli)	White-headed Duck.

#### ORDER COLUMBE.

# Family Columbidæ.

152. Columba livia Brisson, var. domestica?	Fantail Pigeon.
*153 /	Feather-footed Pigeon.
*154. Turtur risorius (Linnæus)	Barbary Turtle-Dove.
*155, vinaceus (J. F. Gmelin)	Vinaceons Turtle Dove.
*156 decipiens Finsch and Hartl	Central African Dove.
*157. " senegalensis (Linnæus)	Palm Dove.
158. Geopelia striata (Linnæus)	Barred Dove.
159. , cuneata (Latham)	Graceful Ground-Dove.
*160. Œun capensis (Linueus)	Cape Dove.
161. Chalcophaps indica (Linnens)	Green-winged Dove.
162. Ocyphaps lophotes (Temminck)	Crested Pigeon.
163. Phlogarnas luzonica (Scopoli)	
164. Calornas nicobarica (Linbæns)	Nicobar Pigeon.

# ORDER PTEROCLETES.

# Family Pteroclide.

*165.	Pterocles	exustus (Temminck)	 Singed Sand-Grouse.
*166.	77	senegallus (Linnæns)	 Spotted Sand-Grouse.

# ORDER GALLINE.

# Family Phasianidae.

167.	Francolinus	vulgaris Stephens		Black Partridge, or Francoliu.
*168.		erckeli (Rüppell)	4 * *	Erckel's Francolin.
•169.	Coturnia co	mmunis Bonnaterre		The Quail.

170	Callipepla californica (Shaw)	Californian Quail.
100	Caccabis chukur (Gray)	Chukur Partridge.
111-	Ammoperdix heyi (Temminek)	Hey's Partridge
172.	Phasianus colchicus, Linnes, var. ulba.	White Pheasaut.
	* (******	Bar-tailed Pheasaut.
174.	477 . 7 . 74 . 1	Elliot's Pheasant.
175.	The ambergia (Leath.)	Lady Amberst's Pheasant.
176.	I mountain a contra	Silver Pheasant.
177.	Euplocamus nycthemerus (Linnens).	Crested Peafowl.
178.	Paro cristatus, Linneu	
179.	rar. all	
*180.	Melengris gallopavo, limas, var. dom.	Black Turkey.
*181.	var. all	White Inrkey.
*182	. Numida meleagris (Linnans)	West African Omnea-lowi.
*183	the second secon	Abyssinian Guinea-fowl.

#### ORDER FULICARIA.

# Family Rallidæ.

*184. Porzana marnetta (Leach) Spotted	Crake.
Little C	ruke.
*186. Crex pratensis, Bechstein Land-Re *187. Porphyrio madagascariensis (Latham) Green-	mcked Purple Coot.
*187. Porphyrio madagascarrinsis (Latimin) *188. Fulica atra, Linuwus The Co	ot.

#### ORDER ALECTORIDES.

# Family Gruidæ.

*189.	Gruz communis, Bechstein	 Grey Crane.
*190.	rirgo (Linnæus)	 Demoiselle Crane.
*191.	Balcaria paranina (Linnens)	 Crowned Crane.

## ORDER LIMICOLE.

# Family Œdienemidæ.

\*192. (Edicaemus scolopus (S.G. Gmelin) Norfolk Plover, or Stone-Curlew.

# Family Charadriidae.

*193.	Vanellus vulgaris, Bechstein	 Lapwing.	
	Honlanterus eninosus (Linnous)	Spur-winged	Plover.

\*195. Gallingo gallinula (Linneus) ... Juck-Suipe.

\*196. Limosa belgica (J. F. Gmelin) ... Black-tailed Godwit.

#### ORDER GAVLE.

#### Family Laridæ.

\*197. Larus fuscus, Limmens ... ... Lesser Black-backed Gull.

# Family Casuariidae.

198. Dromarus nova-hallandia, Vicillot ... Emu.

#### ORDER STRUTHIONES.

#### Family Struthionidae.

199. Struthio camelus, Linuneus ... ... The Ostrich.

\*200. , molyblophanes, Reichenow... Somali Ostrich.

Family Rheidæ.

201. Rhea americana (Vieillot) ... Rhea.

#### Class Reptilia.

#### Onder Chelonia.

# Family Testudinidae.

		Litte	mili resemantance.	
	1.	Damonte	subtrijuga (Schlegel and	
			Müller).	Siamese Terrapin.
	2.	**	reeresi (Gray)	Reeves's Terrapin.
	3.	**	" car. unicolor Gray?	Black-headed Terrapin?
	4.	Bellia er	russicollis Gray	Black, or Thick-necked Terrapin,
	5.	Emys or	bicularis (Linmens)	Pond Tortoise.
	6.	Cistudo	carolina (Linnens)	American Box-Tortoise.
			trijuga (Schweigg.)	Ceylonese Terrapin.
	8.	Cyclemy	s platynota, Gray	Flat-backed Terrapin.
	9.	91	dhor (Gray)	Oldham's Terrapin.
	10.	27	amboinensis (Daud.)	Amboina Box-Tortoise.
	11.	Geoemy	da spinosa, Gray	Spinous Terrapin.
	12.	Testulo	tabulata Wulbaum	Brazilian Tortoise.
	13.	27	emys, Schlegel and Müller	Upland Tortois .
	14.	***	calcarata, Schneid	Spurred, or Grooved Tortoise.
	15.	94	pardalis, Bell	Leopard Tortoise.
	16.	11	radiata, Shaw	Radiated Tortoise.
•	17.		elephantina, Dum. and Bibr.	Elephantine Tortoise.
	18.	99	elongata, Blyth	Burmese Tortoise.
	19.	-9	marginata, Schoepff	Margined Tortoise.
•	20.	27	leithi, Günther	Leith's Tortoise.
-	21.	97	ibera, Pallas	Algerian Tortoise.

## Family Chelonidae.

- Green Turtle. • 22. Chelone mydas (Linnens) ... ...
- Loggerhead Turtle. \*23. Thalassochelys varetta (Linnens)

Family Pelomeduside.

- Adanson's Terrapin. 24. Sternotherus adansoni (Schweigg) ... Family Chelyilida.
- Long-necked Tortoise. 25. Chelodina longicollis (Shaw) ... Family Trionychidae.
- ... Nilotic Soft Turtle. \*26. Trianga trianguis (Forskiil)

#### ORDER CROCODILIA.

## Family Crocodilide.

- Nilotic Crocodile. 27. Crocodilus niloticus, Lanr. ...
  - East Indian Crocodile. porozna, Schurid. ... . . .
  - Alligator. 29. Alligator mississippiensis (Dand.)

#### ORDER SQUAMATA.

## Family Geckonidae.

- Fan-footed Geeko. \*30. Ptyodactylus hasselquisti (Doundorff).
- Turkish Gecko. \*31. Hemidactylus turcicus (Linnaus) ...
- Egyptian Gecko. 32. Tarentola ununlaris (Isidore Geoffroy) Family Agamidæ.
- Judge of the Desert. \*33. Agama mutabilis Merrem ... ...
- ., millida Renss.... ... ... 21 27 77 72 \*34.
- Starred Lizard. stellio (Linnaus) ... ...
- Dab-Lizard. \*36. Uromastix ayyptins (Husselq. & Linn.)
- Funnily Ignanidae. Horned Lizard. 37. Phrynosoma cornutum (Harlan)

Family Varanidae.

- Desert Waran-Lizard. \*38. Varanus grisens (Dand.) ... ... Nilotic Waran-Lizard.
- niloticus (Hassely, & Linn.) .. •:30. Family Lacertidae.
- Green Lizard. 40. Lucerta ciridis (Laur.)
- 11. Acauthodactylus boskianus (Dand.) ...
- Scutellated Lizard. scutchlatus (Aud.) ...
- 43. Eremins rubropunctata (Lichtenstein) Red-spotted Lizard. Family Scincidas.
- Blue-tailed Skink. \*44. Malmia quinquetamiata (Lichtenstein)
- Schmeider's Skink. 45. Eumeces schneideri (Daul.) ...
- The Skink. Ati. Seinens officinalis Laur. ... ...
- Ocellated Sand-Skink. \*47. Chalcides wellutus (Forskäl) ...
- Andonin's Sand-Skink. sepoides (Audonin) ... °48.

	Family Channelcontide.	
*40.	Channeleon valgaris, Dand	The Chameleon.
*50,	Insiliscus, Capo	Basilisk Chuncleon.
	74 . 744	
	Family Glanconiida.	
*51.	Glanconia cairi (Dum. and Bibr.)	Cairo Earth-nake.
	Family Boidas	
	Bon constrictor Linnens	Boa Constrictor.
•53.	Eryx jaculus (Hasselq and Linnens)	Egyptian Sand-Boa.
	Family Colubridge.	
*54.	Zamenia florulentus (Is. Geoffroy)	Flowered Snake.
*55.	diadema (Schlegel)	Clifford's Smake.
	Lytorhynchus diadema (Dum, and Bibr.)	Sand-Snake.
	Tarlophio obtusus (Reuss.)	Blunt-nosed Snake.
	Coelopeltis monspessulana (Hermann.)	Lacertine Snake.
*59.		Moila Snake. Schokari Sand-Snake.
	Psammophis schokari (Forskül) sibilans (Linnwas)	Hissing Sand-Snake.
	Macroprotodon cucultatus (Is. Gooffrey).	Hooded Snake.
	Naia haie (Hassely and Linnans)	Egyptian Cobra.
(30).	Trana nate (Trassell and Dimens)	man pulan cuant.
(10),		ng puni coun.
	Family Viperidae.	
*64.	Family Viperidae.  Cerastes cipera (Hasselq & Linnæns)	Ceristes Viper.
	Family Viperidae.  Cerastes cipera (Hasselq & Linnæus)	Ceristes Viper.
*64.	Family Viperidae.  Cerastes cipera (Hasselq & Linnæns)	Cerastes Viper. Hornoil Cerastes Viper
*64.	Family Viperidae.  Cerastes cipera (Hasselq & Linnaus) cornutus (Hasselq & Linnaus)	Cerastes Viper. Horned Cerastes Viper
*64.	Family Viperidae.  Cerastes cipera (Hasselq & Limneus) cornutus (Hasselq & Limneus)  Class Batrac	Cerastes Viper. Horned Cerastes Viper
*64.	Family Viperidae.  Cerastes cipera (Hasselq & Linnaus) cornutus (Hasselq & Linnaus)  Class Batrac  Onder Ecaud.	Cerastes Viper. Hornod Cerastes Viper hia.
*64.	Family Viperidae.  Cerastes vipera (Hasselq & Limmons) cornutus (Hasselq & Limmons)  Class Batrac  Under Ecaud.  Family Ranidae.	Cerastes Viper. Hornod Cerastes Viper hia.
*64. *65.	Family Viperidae.  Cerastes vipera (Hasselq & Limmons) cornutus (Hasselq & Limmons)  Chass Batrac  Under Ecaud.  Family Ranidae.  Rana mascareniensis. (Dum. & Bibr)	Cerastes Viper. Hornoil Cerastes Viper hia. ATA. Frog.
*64. *65.	Family Viperidae.  Cerastes vipera (Hasselq & Linnaus) cornutus (Hasselq & Linnaus)  Class Batrac  Onden Ecaud.  Family Ranidae.  Rana mascareniensis. (Duna. & Bibr)  Family Bufonidae.  Bajo regulacis, Reuss	Cerastes Viper. Hornoil Cerastes Viper hia. ATA. Frog.
*64. *65. * 1.	Family Viperidae.  Cerastes cipera (Hasselq & Limmons) cornutus (Hasselq & Limmons)  Class Batrac  Onder Ecaud  Family Ranidae.  Rana mascareniensis, (Dum. & Bibr)  Family Bufonidae.  Bujo regulacis, Reuss  Family Hylidae.	Cerastes Viper. Hornod Cerastes Viper hia. ATA. Frog. Square-marked Tool.
*64. *65. * 1.	Family Viperidae.  Cerastes cipera (Hasselq & Limmus)  Class Batrace  Onder Ecaud.  Family Ranidae.  Rana mascareniensis. (Dum. & Bibr)  Family Bufonidae.  Bujo regularis, Reuss  Family Hylidae.  Hyla arborca (Limmous)	Cerastes Viper. Hornol Cerastes Viper hia.  Trog.  Square-marked Tond.  Tree-Frog.
*64. *65. * 1.	Family Viperidae.  Cerastes cipera (Hasselq & Limmons) cornutus (Hasselq & Limmons)  Class Batrac  Onder Ecaud  Family Ranidae.  Rana mascareniensis, (Dum. & Bibr)  Family Bufonidae.  Bujo regulacis, Reuss  Family Hylidae.	Cerastes Viper. Hornol Cerastes Viper hia.  Trog.  Square-marked Tond.  Tree-Frog.
*64. *65. * 1.	Family Viperidae.  Cerastes cipera (Hasselq & Limmus)  Class Batrace  Onder Ecaud.  Family Ranidae.  Rana mascareniensis. (Dum. & Bibr)  Family Bufonidae.  Bujo regularis, Reuss  Family Hylidae.  Hyla arborca (Limmous)	Cerastes Viper. Hornol Cerastes Viper hia.  Trog.  Square-marked Tond.  Tree-Frog.
*64. *65. * 1. * 2. * 3.	Family Viperidae.  Cerastes cipera (Hasselq & Limmons)  Class Batrace  Under Ecaud.  Family Ranidae.  Rana mascareniensis. (Dum. & Bibr)  Family Bufonidae.  Bufo regulacis. Reuss  Family Hylidae.  Hyla arborea (Limmons)  Order Caud.	Cerastes Viper. Hornol Cerastes Viper hia.  ATA.  Frog.  Square-marked Tond.  Tree-Frog.
*64. *65. * 1. * 2. * 3.	Family Viperidae.  Cerastes cipera (Hasselq & Limmons) cornatus (Masselq & Limmons)  Chass Batrac Onder Ecaud. Family Ranidae.  Rana mascareniensis, (Dum. & Bibr)  Family Bufonidae.  Bufo regularis, Reuss	Cerastes Viper. Hornol Cerastes Viper hia.  ATA.  Frog.  Square-marked Tond.  Tree-Frog.  ATA.  Marbled Newt.

VI. FORAGE.

The following Tible shows the nature of jixel vansumed by the minute and its price for each month of 1903.

	7	Parent Property	Water Contra	2 Males Orner	1 Grant Charac.	S Drivel Change	E Cleritand Straw		w Harlow	D Madae.	10 Hilland	-	12 Lentlin.	II Mun.			14 togntables.			Il Sugar.	198	A C F HILL.		at Mailton		MA WEN.		26 Ground Suid.	20 Truing, harmetined	all a little fortt	- Table 1	AS METAW.	HA A LOST OF THE REAL	M. F. Tilkes	Tura.	
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VII. ACCOUNTS.

Table of Receipts and Expenditure, under the verious heads, during 1903.

Mill.	25 25 25 25 25 25 25 25 25 25 25 25 25 2	087
L.E.	25.25 25.25	4,614
EXPENDITURE.	1. Salaries 2. Keeper# clothing 3. Feeding, hedding and fact for minnals. 4. Repairs, upkeep and extension of buildings and cages 5. Furchase of new minnals. 6. Frinting and stationery 7. Band 8. Sundries (Permanent Advance Account). 9. Library Books 10. Upkeep of Girden 11. Return passage of temporary assistant 12. Extra police, telephone and various  BALANOR CHEDIT	GRAND TOTAL
Mill.	<u> </u>	087
L.E.	트로	4,61.4
RECEIPTS.	1. Balance Credit from 1902 2. Government contribution for 1903 3. Grant from Giza-Gezira Gardens Budget. 4. Grant from P.W.D. for repairs 5. Garte Receipts (20-12-02 to 27-12-03, inclusive) 6. Elephant rides 7. Sale of animals, eggs, etc. 8. Sale of animals, eggs, etc. 9. Fines	TOTAL RECHIPTS

## VIII. AQUARIUM.

As mentioned in last year's report the Aquarium at Gézica was opened to the public in November 1902.

A credit of L.E.120 was allowed by the Tanzim Service, P. W.D., to the Zoological Gardens for looking after the tanks and fish for the year 1903; but the actual expenditure only came to L.E.74.191 mills.

A list of the kinds of Nile fish which have been exhibited is appended, with some nates on them written up to 5th March, 1904, that may be of interest.

#### FAMILY MORMYBIDAL

#### 1. Marrasenius isidori.—Anooma.

This quaint little Ident-nosed fish seems to bear captivity well. Individuals have certainly been ten months, possibly over fourteen months, in Tank No. 11, and are still thriving. There are fifteen or more specimens at present in this tank, each 2 to 3 inches in length. They spend most of their time suspended in mid water, with all their fins and tail in perpetual motion, but occasionally for a short time they will lie on the bottom of the tank with fins motionless. They feed on finely chopped-up earth-worms.

## 2. Gnuthomenus cyprinoides.—Anoonia.

This species is also doing well in the Aquarium, several individuals have been from ten to fourteen months in Tank No. 21, and others have been recently added. At the present time there are thirteen specimens in the tank, the largest about 10 inches in length. Though in a state of nature their habits are apparently nocturnal, in captivity they soon learn to feed by daylight and eagerly devour the finely chopped-up earth-worms on which they are fed daily. They usually keep moving about the bottom of the tank, the pectoral and tail fins being almost constantly in motion, the other fins being only occasionally used.

## 3. Mormyrus kannume.—Abu boos.

The curious long-decurved nose of this fish at once attracts the uttention of all visitors. Over thirty individuals, the largest about 12 inches in length, are living in Tank No. 16, a few of these have been now from eleven to sixteen months in the Aquarium, but the majority have been added early in 1904. From observations made on several specimens kept in the Director's House at Giza we find that naturally they spend the day lying quietly on the bottom of the tank but after nightfall become very active, searching energetically for food. When the light from a match or

lamp falls on them in the dark, their eyes shine very remarkably, sometimes white, sometimes gleaming red. They have a curious habit of swimming backwards with the tail leading. In the Aquarium they soon learn to feed by daylight, and it is an interesting sight to ser them searching the bottom of the tank, examining every stone and cavity with their long snoats, for the pieces of chopped up earth-worms which are daily put in for them to feed on. Like many other species of tish they fight a great deal among themselves, and several individuals which died, from time to time during 1903, it is believed had been killed by their comrades; but latterly these fights have been less frequent. Like the Greathonicaux they prefer the lower part of their tank; the pectoral and tail fins are moved most, but there seems less of the constant waving of tins about this species than there is with the other two Mormaridae mentioned above.

#### FAMILY CLUBBIDAL

4. Clupea finta.-Twait Shad, local name Saboorali.

This Mediterranean fish we know ascends the Nile as far as Cairo in the early months of the year. In the latter half of May, 1903, six very small fish caught at the Delta Barrage were purchased for the Aquarium, they apparently belong to this species, and are all still alive in Tank No. 8. They spend the whole day swimming rapidly hither and thither about their tank, moving so continually and quickly that the ordinary visitor to the Aquarium can hardly make out what manner of fish they are. The keepers say they cut bread.

#### FAMILY CHARACINIDAL

5. Hydrocyon forskali.-Kell-el-Bahr, or Dog of the River.

Of the twenty-six species of fish that have so far been tried in the Aquarium this has been least successful. About eight specimens have been exhibited from time to time, they lived from seven weeks to four months, cat freely, appeared in good condition, and then generally died quite suddenly, for what reason has not yet been ascertained; which is curious as a specimen of Hydrocyan brevis, which has apparently similar habits, has done well under similar conditions of captivity. The Kelb-el-Bahr is very active and voracious, feeding only on live fish such as Alentes, which it pursues and captures with lightning-like ngility and either swallows whole or bites right in half, swallowing the half seized. It is found necessary to keep a lamp burning near their tanks all night as if left in complete darkness they damage themselves swimming violently against the walls of the tank, but with a glimmer of light they avoid this. There are a few of these fish in the ornamental water of the Schamlik side of the Zoological Gardens, the largest specimen observed measured

20½ inches (52 centimetres) in length overall and weighed 2.6 lbs. (1.2 kilos.); it was taken alive to the Aquarium, 8th April, 1903, but only lived a few months. Although expensive to feed it is a great pity these fish have not so far done better in captivity, as they are very graceful in form and beautiful in colour, silvery bodies with black longitudinal lines and red tail fins; their large teeth which show even when the month is closed give them a very ferocious expression which their habits do not belie.

6. Hydrocyon brevis.

Of this rare species only one specimen has been obtained, it was purchased 10th November, 1902, and is still alive (5th March 1904), in Tank No. 17. In habits it resembles *H. forskuli*, feeding only on small live fish. It is silvery in colour, with about nine more or less distinct longitudinal black lines on each side of the body, the posterior edge of the tail fin is also black, and the lower lobe of the tail fin red.

7. Alestes kotschyi.-Wri.

Of this beautiful, silvery, salmon-like fish, with a conspicuous red patch on the lower lobe of the tail fin, sixteen individuals which were obtained in October 1902, are living in Tank No. 18; the largest specimen is about nine inches in length. They feed freely on bread daily. They are an active fish, never lying on the bottom of the tank but keeping to mid water or swimming close under the surface. Besides those in the Aquarium there are several in both the Haremlik and Schamlik waters in the Zoological Gardens: the largest specimen noted was 18½ inches (46°3 centimetres) in total length overall and weighed almost 2 lbs, (29 kilos.). When the Esbekia Lake, Cairo, was emptied 12th September 1903 two specimens of Wri were found each measured 21¼ inches (55°24 centimetres) in total length overall and weighed 3°85 lbs. (1°75 kilos.).

## 8. Alestes nurse. - Sardeena.

This is a deeper fish than the Wri, with sometimes a dark spot on either side of the tail. Three specimens were purchased in the Autumn of 1902, and are still alive; one in Tauk No. 18 is about five inches in total length, and in Tauk No. 9 there are two smaller ones, these latter have grown very considerably during their life in the Aquarium. They resemble the Wri in habits, and are fiel on small pieces of bread.

#### FAMILY CYPRENIDAL

## 1. Laber nilotions !- Berlin.

This is an inconspicuous, small, dark-coloured species of Carp, which keeps chiefly to the bottom and sides of the tanks and is fond of hiding away in previous; it is fed on bread. Four individuals were obtained 7th August 1902, two more 5th November 1902, and two about 15th April 1903; it is believed they are all still alive in Tanks Nos. 2 and 24.

#### 10. Lahen forskuli.

Another small Carp of similar habits to the last species, from which it is distinguished by the high falcate dorsal fin and very lumpy nose. A specimen purchased in the autumn of 1902 is still alive in Tunk No. 2, and is apparently growing in size.

## 11. Labeo horie !- Libres.

This fine Carp seems to be one of the commonest fishes in the neighbourhood of Cairo, and attains a large size. Large specimens transferred to the Aquarium have, as was perhaps to be expected, not done well, developing a white fungus-like growth on their scales and over their eyes, but young individuals do well and increase rapidly in size, feeding on bread. Having had to be occassionally shift of from one tank to another, as the tanks were required for other purposes, it is not certain how long any individual Libees has lived in captivity, but some now thriving in Tank No. 24 have certainly been in the Aquarium over a year. This species occurs in both the Haremlik and Selamlik waters in the Zoological Gardens; a specimen caught 8th April 1903, was 25 inches (63'5 centimetres) in total length overall, and weighed 6:17 lbs. (28 kilos.), and one caught 3rd September 1902 whose length was, unfortunately, not recorded weighed 825 lbs. (3.75 kilos.). In emptying the Esbekia Lake, 12th September 1903, many specimens were found; the largest was 244 inches (62.32 centimetres) in total length overall and weigh d 7.3 lbs. (3.3 kilos),

## 12. Barlas bynni.-Bynni.

The Egyptian Barbel does well in captivity. Five specimens lived in the Aquarium from 26th December 1901 to 1st January 1903 (one year and five days) when they were accidentally killed by the tank running dry during the night. More specimens were obtained, 7th to 13th January 1903, which are now alive in Tank No. 24; they are fed on bread. In emptying the Citadel Pond in the Zodogical Gardens, 29th March 1903, only two Bynni were found, the larger of these measured 11½ inches (29.2 centimetres) in total length overall, and weighed 0.55 lbs. (0.25 kilos.); but when the Esbekia Lake was emptied, 12th September 1903, a large number of Bynni were caught, four of the finest specimens measured:

Total length overall	Weight
25 inches (63.5 centis.)	9°26 lbs. (4°25 kilos.)
261 inches (67:3 centis.)	9:91 lbs. (4:5 kilos.)
25½ inches (64.7 centis.)	11 lbs (5' kilos.)
26 inches (66 centis.)	12:35 lbs. (5:6 kilos.)

This last fish Mr. G. A. Boulenger refers to in "The Field." No 2653, of 31st Oct. 1903, as being the largest of its kind on record.

15. Barbus perince.

This Barbel seems only to attain a length of about three inches, and is conspicuous by the black spots on each side of the silvery body: there appear to be usually three of these spots, sometimes two or four, and rarely as many as seven. It does well in captivity either in a small glass bowl or in a large aquarium tank, feeding readily on bread-crumbs, biscuits, etc. The numerous specimens in Tank No. 9 were caught in August 1902. There are also individuals in No. 24 and other tanks, in one or two of which it is believed this species brief (and the young fish grew up) in the summer of 1903, as it does in Sclamlik caud of the Zoological Gardens.

#### FAMILY SHARRIDE.

14. Clarias lazera.—Armoot.

Two specimens caught in the reservoir of the Giza Water Works, 26th December 1901 are still alive (5th March 1904) in tank No. 23, and are each about twenty-three inches in length; and in Tank No. 14 there are about twenty-four specimens, from about ten to sixteen inches in length, purchased in August 1902. These fishes are fed on raw meat, and eat large quantities of it; after a meal the distended stomach quite alters the general appearance and slope of the fish. With a sufficiency of food a crowd of individuals will live amicably together, but hanger leads to internecing warfare.

A species of Clarias, either C. lazera or C. anguillaris occurs in the Schmlik Canal of the Zoological Gardens, on the 23rd Sept. 1903 four small specimens were caught, one of which was placed in No. 23 Tank but has not been seen since; on the 21st February 1904 a specimen was found dead, choked by a Synodontis schal which it had attempted to swallow, this Clarias measured 45½ inches (1°15 metres) in length and weighed 22 lbs. (10 kilos.), and on 22nd February 1904 another specimen was found dead which measured 48½ inches (1°23 metres) in length and weighed 22°7 lbs. (10°3 kilos).

15. Entropias ep.

The specimens of this fish in Tank No. 6 have not been seen for several months.

16. Schilbe mystus .- Schil Bayer.

17. Siloranodon auritus.-Widanalı.

There are several specimens of these two species in Tank No. 6 where they have lived over a year and appear to have increased considerably in size; they are fed on bread.

18. Bagrus bayad.—Bayad.

Although of curious appearance, on account of its extremely long "whiskers," the Bayad seems of little exhibition value, the smaller specimens

spend the whole day completely hidden in the crevices of the rock-work of the tanks, and the larger ones, unable to hide away, lie motionless hour after hour; they have not been observed to eat, but it is found that raw ment placed in their tank over night disappears before morning; large specimens have lived over ten months in the Aquarium, and of the five small specimens now in Tank No. 4 about three have probably been there considerably over a year. When the Esbekia Lake was emptied, 12th Sept. 1903, many Bayad were found, one of the finest specimens measured 26 inches (66 centis.) in total length without including the tails filiments, and weighed just over 6 lbs. (2.75 kilos.)

## 19. Chrysichthys auratus.—Abu Rial.

In Tank No. 18 there are about seven individuals who have been there since the latter part of 1902, they spend the whole day completely hidden in the crevices of the rock-work except when they are fed when they come out into the daylight, eagerly cat pieces of bread, and then retire again completely out of sight.

#### 20. Synodontis schal.—Schall.

This thick-set Idackish fish with armoured head and feeler-bestudded mouth is very numerous near Cairo; it is armed with three terrible spines, one on the dorsal fin and one on each pectoral fin, which give many lad wounds to men working in the water with bare feet and hands. About fifty specimens, varying from 2 or 3 to 13 inches in length from nose to fringe of tail-fin are living in Tank No. 15, some of these have been in the Aquarium certaintly since August 1902 and probably since March 1902. At first it was found that the smaller specimens worried and injured the larger ones by eating their skin, especially about the dorsal fin, but for some months now this has stopped, the supply of artificial food being probably better regulated. The Schall are fed on bread and meat.

Many Schall were found in the Esbekia Lake when it was emptied 12th Sept. 1903, the largest specimen measured 15½ inches (3236 centis.) from nose to extreme end of mil-fin and weighed 156 lbs. (75 kilos.) Equally large specimens have been found in the Zoological Gardens, where this species lives in both the Haremlik and Schamlik waters.\*

#### 21. Malopterurus electricus.-Raa-Ard.

An Electrical Fish purchased 24th November 1902, only lived three mouths and four days in the Aquarium having died 28th February 1903. In April 1903, two more were purchased and placed in Tank No. 22, where they are still alive and apparently in good health (5th March 1904). Two more have recently (February and March 1904) been received and placed in Tank No. 12. These fish appear to spend nearly the whole day lying

<sup>\*</sup>N.B. On the 7th March 1901 an Albino Schull, about 7 inches long, was purchased; a beautiful fish, white all over with pink shades, and black eyes.

motionless on the bottom of the tank, from time to time flapping their pectoral fins. Both the Director and some of the keepers having received strong electrical shocks from comparatively small fish of this species kept at the Director's Huuse; they have not cared to experience how powerful a shock the large fish in Tank No. 22 may be able to give.

## FAMILY MURENIDE.

22. Anguilla valgaris! - Taban samak.

Five Eels caught at Giza in March 1902 were placed in Tank No. 1, and eleven more added during the summer of 1902. One or two can generally be seen in this tank, but whether the whole sixteen are still alive is not known, as the rockery in the tank affords them unmerous places for conscalment.

## FAMILY SERRASIDÆ.

23. Lates nilotious.—Ishr, or Great Nile Perch.

In the last months of 1901 and earlier part of 1902 when experiments were being made in keeping the Nile fish in captivity this species appeared to be the most difficult of all to manage. Large specimens caught and put in the Aquarium tanks, although they would feed, would only live a few days or weeks; but when in the early autumn of 1902 the young Lates of the year appeared in the Schamlik Canal of the Zoological Gardens several were caught and taken to the Aquarium, where some flourished and grew rapidly in size while others completely vanished and there is little doubt they were eaten by their brethren.

There are now (5th March 1904) in the Aquarinm in Tank No. 5 one very small Ishr, in No. 7 one medium-sized specimen caught in the Esbekia Lake 12th September 1903, in No. 20 four young individuals the largest about 10 \frac{1}{2} inches in total length, one at least of these has been in this tank since October 1902, and in Tank No. 24 there is also one small specimen.

Their natural food uppears to be live fish only, but it is found they will eat freshly dead fish, such as Alestes, thrown into the tanks, seizing them as they sink and swallowing them whole. One of the most noticeable points about the Ishr is its gleaming eyes, which in some lights glow red like dull signal lamps; another is its power of rapidly changing its colour, and the uppearance and disappearance of dark markings all over the sides of the body—further observations are wanted concerning when and how this is carried out.

As is well known this species attains to a great size, but it is surprising how large it grows in quite small pieces of water. It occurs in both the Haremlik and Schamlik waters of the Zoological Gardens. On the morning of 3rd February 1904, after a very cold night, a specimen was found dead

in the Lotus Lake which measured in total length 43% inches (1°114 metres) and weighed 36°37 lbs. (16°5 kilog.). On the 12th September 1903 when the Esbekin Lake was emptied many small and medium-sized Lates were caught and one monster who measured in a straight line from point of lower jaw to end of tail fin 48 inches (1°219 metres) and weighed 55 lbs. (25 kilos).

#### FAMILY CICHLIDE.

24. Tilapia ailotica.—Bolti.

This Perch-like fish lives very well in captivity in mything from a wide-neeked glass bottle to a large tank; it eats readily insects, ment, bread, biscuit and various plants, and large specimens probably eat small live fish also, in fact mything they can get. Different from most fish, large specimens newly caught and placed in the Aquarium will do well; a Bolti of the largest size caught at Giza 16th March 1902 lived ten months and twelve days in Tank No. 1, dying then probably not from the results of captivity but from cold. The Bolti is very susceptible to a fall of temperature, both in the Aquarium tanks and in the ponds of the Gardens a sudden spell of cold weather kills large numbers, and after even one degree of frost at night hambreds of these fish are found dead in the canals. This winter therefore Tank No. I was protected by glass to prevent the cold air reaching the surface of the water, which consequently maintained a slightly higher temperature than it would have otherwise done and the fish did much better. The largest specimen noted from the Zoological Gardens was 16 inches (40% centim.) in length and 4:18 lbs. (19 kilog.) in weight, and from the Esbekia 17 f inches (43 8 centim.) and 3.85 lbs. (1.75 kilog.).

#### FAMILY TETROPOSTULE.

25. Tetrodon jalarka. - Fahaka.

In Tatik No. 10 there is a Globe Fish that was eaught 21st July 1902, so has now been over one year and seven months in captivity and is still thriving; this specimen will not allow any other fish to share its tank, attacking them fiercely. In Tank No. 19 there are three smaller specimens obtained respectively on 21st October 1902, 10th November 1902 and 6th January 1904. They are fed on raw ment.

As du ing 1902, Mr. G. A. Boulenger, F.R.S., of the British Museum, and Mr. W. L. S. Loat, lately Inspector of Nile Fish, kindly gave information on many points concerning the above fish.

Besides the Nibe Fish specimens of Gold-fish Carazina auratus are also exhibited. In tank No. 13 there are about nineteen ordinary sized specimens which were purchased in November 1901, and also one large individual which was caught in the Esbekia Lake, 12th Sept. 1903, and is about eleven inches in length and very fut.

Some fresh-water crabs eaught in the Nile have also been placed in the Aquarium, but owing to their retiring habits are seldom seen, but at least one individual it is certain has lived over a year there and is believed to be still in Tank No. 13; Dr. J. G. de Man has kindly identified this species as Potamon (Parathelphusa) niloticum, H. M.-E. A species of Shrimp found in the Nile has also been exhibited and specimens sent to Dr. de Man.

## IX.-APPENDIX.

A. The following report on the butterflies occurring in the Zoological Gardens has been kindly written by Mr. Philip P. Graves, of Cairo.

# List of Butterflies taken or observed in the Giza Zoological Gardens.

## FAMILY PIERIDE.

- 1. Pieris raper.—Common in all months.
- 2. Euchlæ belemin,—End November to April. Occasionally enters Gardens from neighbouring fields. Food plant Mustard, Ernea, and other Cruciferse.
- 3. Colina educa.—Most months of the year. Occasionally common in the Gardens. Food plant. Various kinds of clover.

## FAMILY NYMPHALIDE

- 4. Pyrameis atalanta.—\*The neighbourhood of the Zoological Gardens seems to be the chief stronghold of this fine species in Cuiro. It is far more common at Alexandria.
- 5. Pyrancis cardai.—†Always abundant and swarms in autumn. Food plant. Thistles.
- 6. Danais vhrysippus.—This fine butterfly is very abundant at all seasons in the Zoological Gardens. It is a variable species and I have heard that the form with white posterior wings Danais var. alcippus has been seen there.

## FAMILY LYCENIDE.

- 7. Hypolycoma livia.—I feel a little doubt about including this species since, when in flight, No. 8 may be mistaken for it. I have however seen it in all the chief gardens in Cairo E. of the River and at Zeitnu, etc. The Larva feeds on the "Sant" Acacia and on Acacia faracsiana, boring into the pods whose seeds and pith it devours. Occurs from early summer to November.
- S. Lampides betiens.—Common in summer and often occurs in the winter months. Food plant. Vételies und Colluten.
- 9. Lampides telicanus.—Summer und autumn. Very abundant August und September. Food plant. Vetelies aud Alhagi manniferum.

<sup>&</sup>quot;"Rist Admirat". †"Painted Lady."

 Chilades trochilus.—One male seen. A local species about Cairo occurring in spring and from August to October.

11. Lycena lysimon. - "Abundant throughout the year except January and February.

#### FAMILY HESPERIDÆ.

Parnara mathias,—Common in spring, summer and autumn. This
species has a habit of sunning itself on the hottest stones in rockeries and
on pathways. Female oviposits on grasses.

I think it highly probable that Parmara nostradamus, a common species in the Barrage and Ezbekia Gardens, and Lampides theophrastus are also

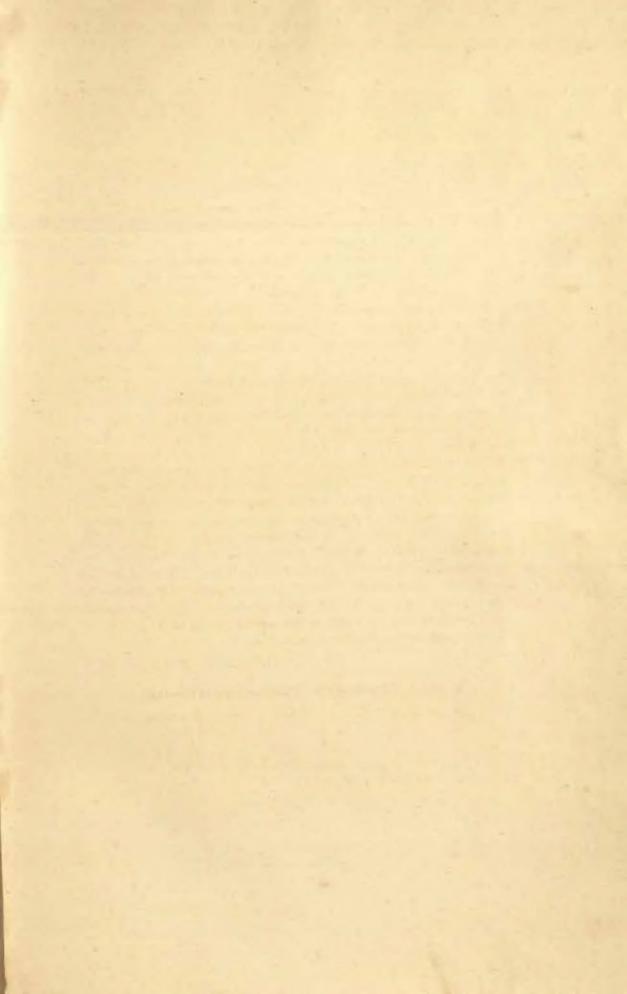
to be taken in the Giza Zoological Gardens.

The small number of species in the above list would be remarkable in any country but Egypt. The absence of woods and of waste ground covered with vegetation and the very thorough cultivation and flooding of the fields accounts for this pancity. Of the 12 species given in the above list 9 certainly oviposit on common crop plants or weeds of cultivation. Thus far I have taken or observed 20 species in the neighbourhood of Cairoincluding Marg and Helwan. Two of these-Hypolycena livia and Lampides theophrastus are East African and Arabian species, though the latter extends in the west to Andalusia. Two-Melitora var deserticola and Lycona allardi-have only been recorded previously from the interior of Algeria and Morocco. Pieris glanconome is a desert species ranging from the Sinai and the Persian Gulf to Shendi or further and the remainder are wide-spread Mediterranean or Cosmopolitan species without exception. Thus, omitting the better-known forms, Parnara mathias ranges from Cyprus to Malaya. Lycena lysimon from Andalusia and the Riviera to India, and Ch. trochilus from the Balkans to North Australia. The Maryut District and the "Wadis" of the Acabian and perhaps the Lybian desert seen to me the most promising localities for the collector, and it would be most interesting to know at what point in Upper Egypt the desert butterflies of the Sudan begin to occur.

P.P. Graves. 27th Nov., 1903.

# B.-List of Publication of the Zoological Gardens.

Report	for	the year		***		1899	Price	P.T.5 (one shilling)
The same				***		1900	**	P.T.5
35	. 77	75			***	1901		(out of print).
39	22	**				1902		P.T.5
31	: 15	77					122	(out of print).
Guide		1st Editio	m (pu	DHSI				
31		2nd "	.(	99	1	8.12.03)	21	P.T.5
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